

Feb. 5, 1946.

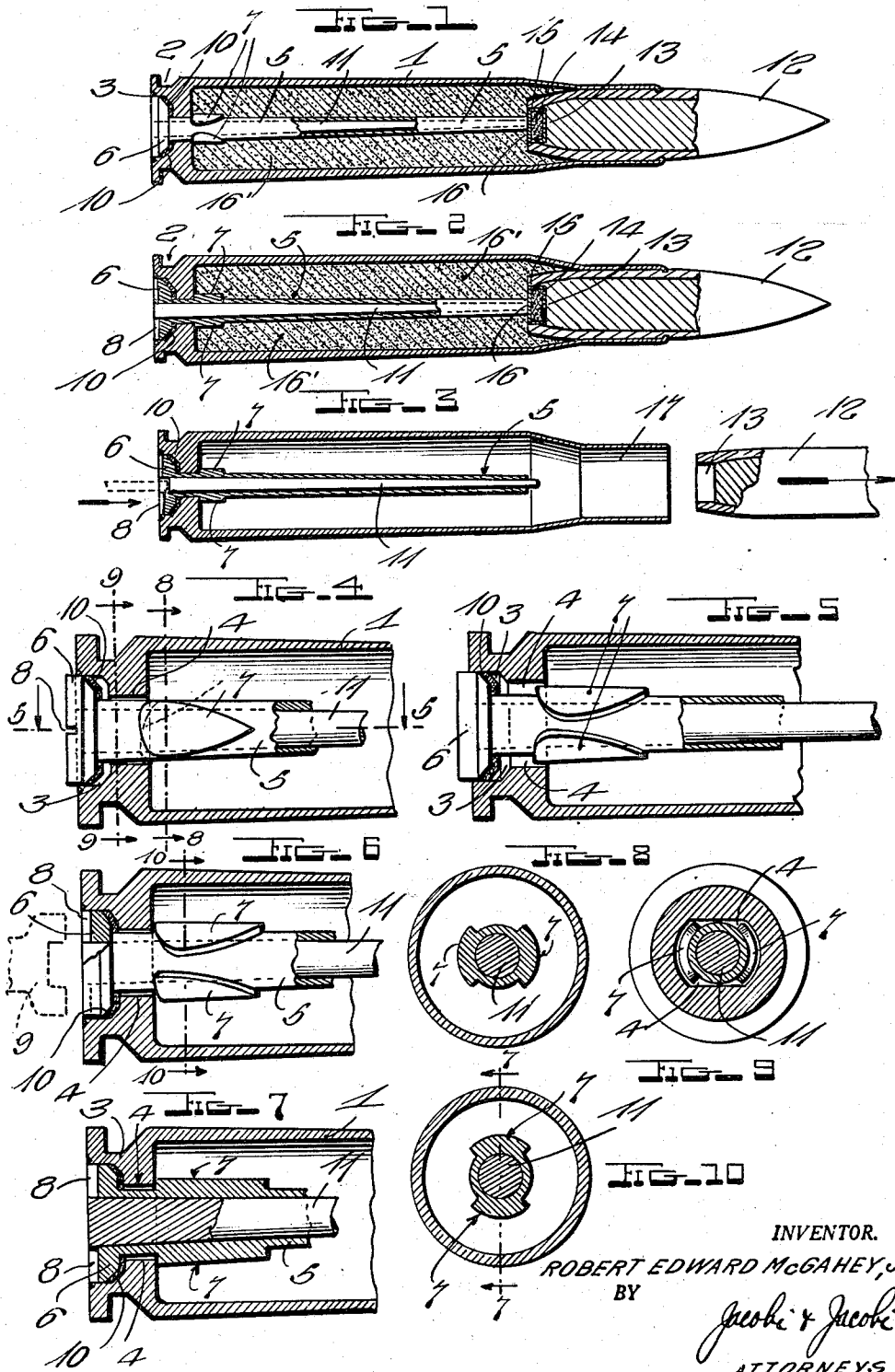
R. E. McGAHEY, JR

2,394,249

CARTRIDGE

Filed Dec. 23, 1941

3 Sheets-Sheet 1



INVENTOR.

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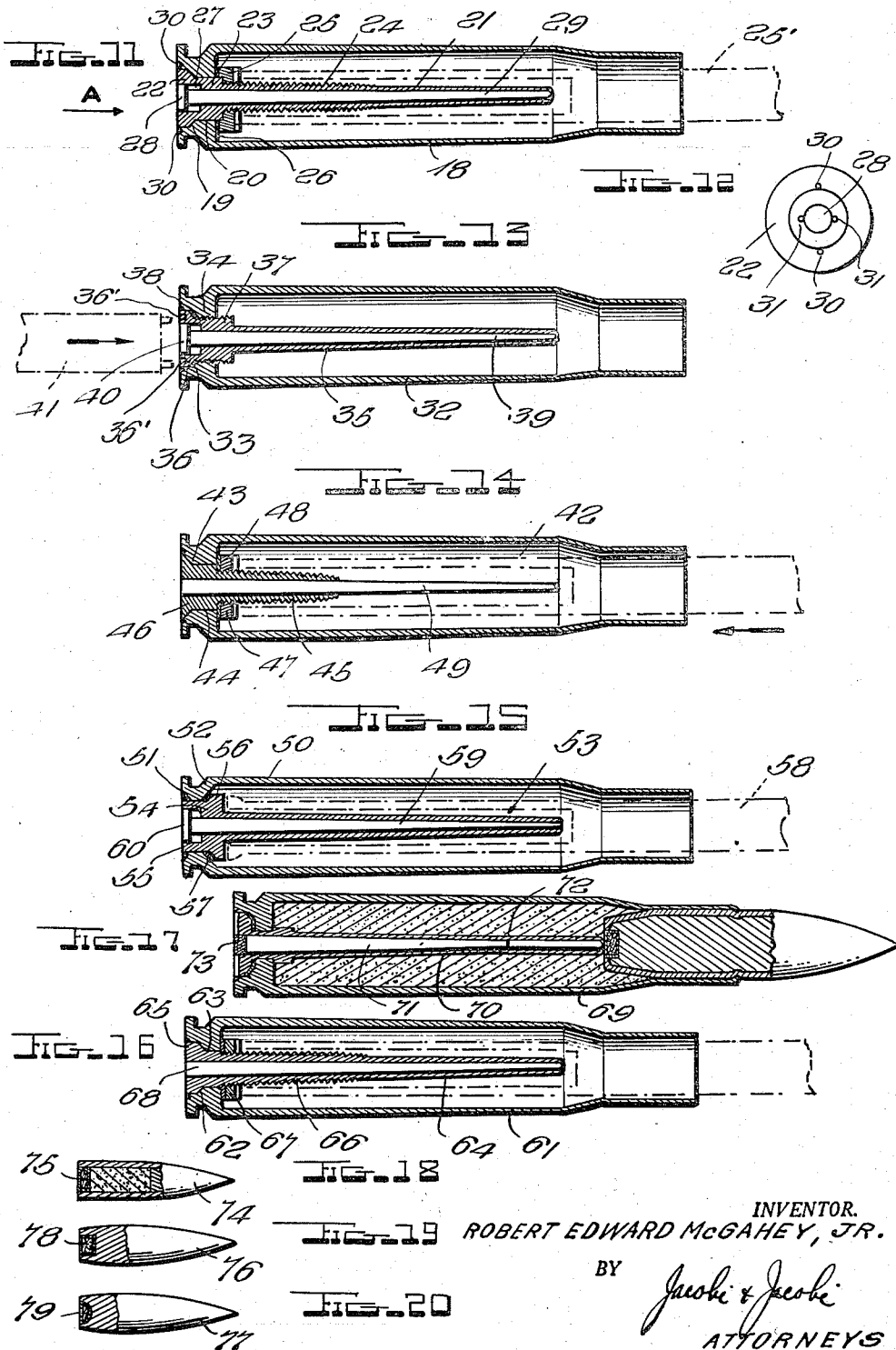
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CARTRIDGE

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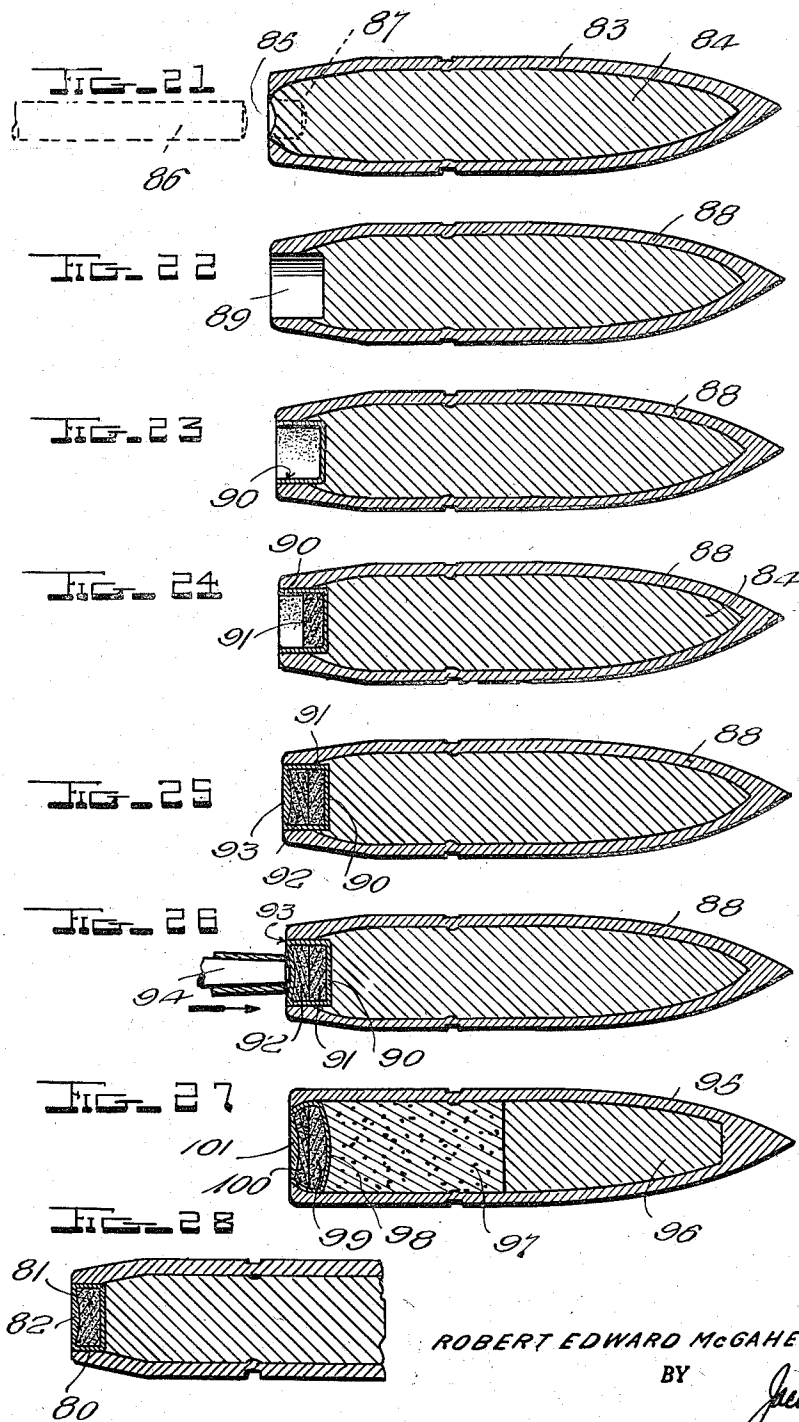
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,394,249

CARTRIDGE

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Application December 23, 1941, Serial No. 424,212

8 Claims. (Cl. 102—38)

My invention relates to new and useful improvements in cartridges for high powered and rapid fire guns, the primary object of the invention being to provide a cartridge case structure capable of repeated re-use without requirement for return of said case to a designated point for remelting and reprocessing.

A further object of the invention resides in the provision of means adapting readily expended cartridge cases for re-use.

Still another object of the invention resides in the provision of a structure adaptable to a standard cartridge case for coaction with and in the firing of a priming charge supported in the heel or rear end of a projectile supplied for and loaded in said case.

Still another object of the invention resides in the provision of a gas check within a cartridge case to prevent the escape of powder gases upon the firing of the priming charge, thereby utilizing the fullest effect of the energy built up within the cartridge for the propulsion of the projectile.

A still further object of the invention resides in the provision of an adaptor removably secured within a cartridge case comprising a tubular casing and a striking pin longitudinally movable within said casing.

A still further object of the invention resides in so mounting the adaptor within the cartridge case and so constructing the tubular member and striking pin that when the latter is driven longitudinally to its effective actuating position to ignite a priming charge, powder gases will be prevented from escape through said adaptor.

A further object of the invention resides in providing an adaptor in which the tubular element is internally tapered and the striking pin therewithin coincidentally tapered to provide a gas check therebetween when said pin is driven to its effective operating or firing position.

Still another object of the invention resides in the provision of a priming charge supported in the heel or rear end of the projectile, with the face of the charge being open in the direction of the powder charge, whereby the full force of the primer may be exerted upon said powder charge.

A still further object resides in the provision of a primer located forward of the powder charge and comprising two elements, one a fast burning mixture and another a slow burning mixture, so that the burning effect upon said powder charge after the initial point of ignition will continue throughout the length of the barrel of the weapon until the projectile has left the muzzle.

A further object of the invention resides in

sealing the priming charge in the heel of the projectile to prevent contamination with the metals of the projectile and the atmosphere and thus avoid deterioration or injury to said charge.

A further object of the invention resides in the provision of a type of sealing preparation which, when applied to the outer face of the priming charge, will act as a cushion or buffer for the striking pin within the cartridge case under normal conditions but which, upon the firing of the charge, will disappear and leave no residue either on the projectile or within the cartridge case.

Another object of the invention resides in providing a cartridge which may be easily and quickly loaded, either mechanically or manually, utilizing a fresh primer with each reloading.

And a still further object resides in providing a device which is comparatively simple and durable in construction, inexpensive to manufacture and one which will prove very efficient and useful in operation.

With these and numerous other objects in view, my invention consists in the novel features of construction, combination and arrangement of parts as will be hereinafter referred to and more particularly pointed out in the specification and claims.

In the accompanying drawings forming a part of this application,

Figure 1 is a longitudinal sectional view taken through a cartridge, constructed in accordance with my invention, parts of the adaptor being shown in elevation;

Figure 2 is a similar view, with the major portion of the adaptor shown in section;

Figure 3 is a view similar to Figure 2, after the priming pin has been moved to its effective operating position, showing the projectile being ejected from the cartridge case, the powder having been exploded;

Figure 4 is a fragmentary enlarged sectional view of the inner end of the cartridge case with the adaptor about to be applied thereto;

Figure 5 is a view similar to Figure 4 but taken on a plane at right angles to the latter;

Figure 6 is a view similar to Figure 4 with the adaptor locked in place in the cartridge case;

Figure 7 is a view similar to Figure 6 with the adaptor elements shown in section, and a portion of the priming pin shown in elevation;

Figure 8 is a vertical transverse section as seen through the line 8—8 of Figure 4;

Figure 9 is a similar view as seen on the line 9—9 of Figure 4, looking in the direction of the arrows;

Figure 10 is a similar view as seen on the line 10—10 of Figure 6, looking in the direction of the arrow;

Figure 11 is a vertical longitudinal section through a slightly modified form of my invention;

Figure 12 is a rear end elevational view of a cartridge constructed in accordance with my invention, showing particularly the manner of securing the adaptor tube in place in the base of the cartridge case and, likewise, the manner of securing the head of the striking pin in place in the head of said tube to prevent casual displacement of these elements;

Figure 13 is a similar view of a further modification of the invention;

Figure 14 is a similar view of a still further modified form of the invention;

Figure 15 is a similar view of a further modification of the invention;

Figure 16 is a similar view of a still further modified form of the invention;

Figure 17 is a vertical longitudinal sectional view taken through a cartridge showing a further modified form of adaptor;

Figure 18 is an elevation partly in section of one type of projectile adapted to be used in the employment of my invention, showing the recess in the heel of the projectile with the priming charge sealed therein;

Figure 19 is a similar view showing a primer filled in a recess of a different type of projectile;

Figure 20 is a similar view showing a modified form of recess;

Figure 21 is a vertical longitudinal sectional view taken through a boat-tail solid projectile, showing its relation to a tamping tool for forming the primer recess in the tail or rear end thereof, said recess being shown in dotted line; *

Figure 22 is a similar view showing a primer recess drilled in the rear end of the projectile;

Figure 23 is a similar view showing the recess coated with a cellulose preparation;

Figure 24 is a similar view with one element of a dual priming charge introduced in the coated recess;

Figure 25 is a similar view with both elements of a priming charge introduced in the coated recess, the outer or open face of the primer being also shown coated with the cellulose preparation;

Figure 26 is a view similar to Figure 25 showing the relationship of the sealed primer to the adaptor tube and striking pin, the cushioning effect of the outer cellulose coating being particularly illustrated;

Figure 27 is a similar view of a further modified form of projectile of the tracer type, showing the primer, with both elements thereof sealed in the recess or pocket at the rear end thereof,

Figure 28 is a fragmentary detailed longitudinal sectional view taken through a boat-tail solid projectile showing a primer comprising a single element, sealed in the recess at the tail or heel of the projectile.

In the manufacture of cartridges used for military purposes, it is a known fact that the most costly component thereof is the brass cartridge case. Aside from the high cost of the metals, the processing of a brass cartridge case, involving the various steps of annealing, drawing, drilling, recessing, swaging, cutting of the extracting groove and introducing of the priming charge, necessarily involves considerable time, labor and expense. At the present time, with an unparalleled shortage of brass and its essential com-

ponents, copper and zinc, and the necessity for quick action in the completion of large quantities of munitions, there is an apparent need for an efficient means whereby expended cartridge cases may be quickly and readily treated and reused. To this end I have provided my new and improved adaptor means affording ready adaptation of expended cartridge cases for indefinite reuse, which means also includes the re-location of a primer charge forward of the powder charge so that the maximum effects of the powder may be obtained in the propulsion of the projectile from the cartridge case. While my invention contemplates the utilization of expended cartridge cases for purposes of economy, it is to be understood, of course, that my invention is equally well adapted for use in the original manufacture of cartridges.

It has been known that cartridge cases have been retrieved and returned to the places of manufacture for re-use. It is also a known fact, however, that this involves a costly operation, since it involves melting and reprocessing. United States military organizations have discontinued attempting to re-use expended cartridge cases because of the loss of time, labor and tremendous expense involved therein. However, it is the purpose of my invention to slightly alter the conventional cartridge case and adapt the same for re-use indefinitely, the cost of such alteration and adaptation being so slight and the saving being so great as to justify adoption and practice of the invention by all military organizations. To this end I provide generally an adaptor comprising a tubular insert which is removably secured in the base of the standard cartridge case through which is actuated a striking pin for coaction with a priming charge recessed at the time of manufacture in the tail or heel portion of the projectile, which is loaded into the neck of the cartridge case.

In describing the invention, I shall refer to the drawings in which similar reference characters designate corresponding parts throughout the several views and in which the numeral 1 designates a standard high pressure cartridge case, usually made of brass, and of any desired caliber. The rear or closed end of the case 1 just beyond the extractor groove will be termed, for convenience, the base of the cartridge case. This base, which is ordinarily provided with a reduced opening to receive a primer, is processed from the outer face thereof to form the enlarged seat 3, the lower wall of which is tapered somewhat conically and leads to a keyhole opening 4 passing through the inner shoulder of the base to afford communication with the interior of the cartridge case. As previously indicated, this invention contemplates the use of presently used cartridge cases and the enlarged seat 3 and the keyhole slots 4 may be readily formed in such cases with little or no effort and slight cost, but the seat and keyhole slot may be provided at the inception of the manufacture of cartridge cases as well. This formation of enlarged seat and keyhole slot permits the application to the cartridge case of my adaptor.

The adaptor comprises a tube 5 of a predetermined length, although I do not wish to be limited as to the length of this tube, the one end of said tube being formed with a head or the like 6 thereon for reception in the seat 3 of the cartridge case when said tube is introduced through the opening in the case of the latter. This tube 5 is tapered slightly, both internally and externally, from the head 6 thereof toward the free end.

Various means may be utilized for the retention removably of this adaptor tube in proper position within the cartridge case and in Figures 1 to 10, inclusive, I have illustrated a preferred form of securing means, although I do not wish to be limited to this specific means. In this form of the invention the adaptor tube 5 is provided externally at points adjacent the head thereof with a pair of diametrically opposed cam members 7 which are integrally or otherwise formed thereon, said cam members being permitted to enter the interior of the cartridge case through the key-hole slot 4. In Figures 4 and 5 of the drawings, I have illustrated the adaptor tube about to be introduced into the cartridge case and in Figure 6 I have shown the adaptor tube secured in position therein. When the tube is positioned as shown in Figure 4, it is only necessary to give the head 6 a one-quarter clockwise twist, whereupon the edges of the cam members 7 will contact the internal shoulders on the base of the cartridge case obviously drawing the head 6 into the seat 3. This will leave the external face of the head flush with the outer face of the cartridge base. In order to facilitate the twisting of this head 6 to secure the same in position in the cartridge case, the outer face of the head is provided with the grooves 8 which may be engaged by the tool 9, shown in dotted lines in Figure 6 of the drawings. In order to provide a gas check or insurance against leakage of pressures when the head 6 is positioned in the seat 3, I provide between said head and seat a seal 10 which may be formed of any desired material.

Mounted for longitudinal movement within the tubular member 5 is an elongated striking pin 11 which is tapered coincident to the taper of the bore of said tube 5, so that at a certain position in the movement longitudinally of the pin within said bore, the outer free end of said pin will extend beyond the outer free end of the tube and said pin will frictionally bind or substantially fuse itself to the inner walls of said tube to form a seal or gas check. At the extended position of the pin with respect to the tube, the outer free end of said striking pin is adapted to coact with a primer recessed in the heel or rear end of a projectile to be hereinafter and more particularly described. Obviously, in the normal position of the pin with respect to the tube, the rear end of said pin is held, by a means hereinafter referred to, in a position to receive the action of the firing pin of the weapon in which the cartridge is introduced.

Ordinarily, a primer, in the conventional cartridge case, is supported in the base of the case, but since my invention contemplates the use of an adaptor which may be retained indefinitely within the cartridge case and applied through the opening which ordinarily in a standard cartridge supports a primer, it becomes necessary to provide a primer located in the cartridge case just forward of the free end of the striking pin. In such position, the primer will also be forward of the powder charge which is introduced in the cartridge case surrounding the adaptor tube and striking pin. As aforesaid, the primer in this instance is recessed in the heel or rear end of the projectile at the source of manufacture of the latter and said projectile introduced to the neck of the cartridge case carrying my improved adaptor.

As shown in Figures 1 to 3, inclusive, of the drawings, the projectile designated by the numeral 12, is provided in its heel or rear end with a recess 13. This recess is adapted to receive

therein the priming mixture designated generally in the drawings by the numeral 14. In order to seal the priming charge against contamination with the metals of the projectile, the walls of the recess 13 are coated with a cellulose preparation 15 preferably by spraying. This being an open faced primer, it is desirable to seal the same against contamination with the atmosphere to prevent deterioration and I, therefore, coat the outer face of the priming mixture with a similar cellulose preparation, or other inflammable material, 16. This cellulose coating for the walls of the recess and for the outer face of the priming mixture will burn with the explosion and leave no residue within the recess 13 or within the cartridge case.

The cellulose coating is pliable and resilient but tough, serving as a protective covering against injury to the priming mixture. Being pliable and resilient, the coating 15 on the outer face of the mixture serves as a cushion or rest for the outer free end of the striking pin 11 when the projectile is inserted in the neck of the cartridge case, thus insuring against premature explosion of the primer at the time of loading. The pliability and resilience of this coating is best illustrated in the form of the invention shown in Figure 26 of the drawings.

In the assembling of a cartridge of this construction, powder is obviously introduced through the neck of the cartridge case to surround the adaptor tube and pin and the powder in the drawings are designated by the numeral 16'. When the projectile, with the priming mixture recessed and sealed in the heel thereof is introduced through the neck of the cartridge case, with the predetermined number of grains of powder already introduced therein, the outer or free end of the striking pin, as aforesaid, will contact more or less lightly with the sealed open face of the primer. This dormant or inactive position of the striking pin is best illustrated in Figures 1 and 2 of the drawings. When the striking pin 11 is driven forwardly under action of the firing pin of the weapon in which the cartridge is placed, said pin will take a position as best shown in Figure 3 of the drawings, whereupon the forward or free end thereof will enter the recess 13 in the projectile to the full extent of said recess, causing ignition of the priming mixture and explosion of the powder 16'. At this point, the tapering of the striking pin 11 and the bore of the tube 5 is such that said pin is wedged or literally fused to the bore of said tube, thereby rendering an absolute gas check or pressure seal, preventing the escape of any pressures rearwardly through the cartridge case. Thus, all energy and gas pressure is utilized in the propulsion of the projectile on its journey and in Figure 3 of the drawings I have illustrated the projectile being fired from the cartridge case. The positioning of the priming mixture forwardly of the powder in the cartridge case, will enable all grains of the slow burning powder to be fully ignited and burned before the projectile leaves the muzzle of the weapon and, thus, the maximum energy of the powder charge is obtained in the propulsion of the projectile. The necessity for a positive sealing of the striking pin and the adaptor tube is apparent when it is considered that in a 30-caliber cartridge powder gas pressures vary from 40,000 to 60,000 pounds per square inch and such pressures are increased proportionately in cartridges of higher caliber.

Obviously, the introduction in the conventional type of cartridge case of my improved adaptor, including the tube and striking pin, displaces certain powder space, but this may be compensated for in several different ways. For instance, powders rendering higher pressures than those ordinarily created by the powders used in standard cases may be utilized. The positioning of the open faced primer forwardly of the powder charge will give a full and direct ignition to the powder which will overcome some of the losses of energy or pressures existing in the standard types of cartridges wherein the primer is located in the base of the cartridge case, rearwardly of the powder charge. Likewise, this direct primer charge may be made more effective by the use of two primer elements or layers, the first of which will cause an initial ignition, being an element of concussion, and the second of which will enhance progressive burning of the powder through the barrel of the weapon, same being a slow burning mixture. Such a form of priming mixture is best illustrated in the forms of the invention shown in Figures 25 to 27, inclusive, and hereinafter and more particularly described.

It will be seen, therefore, that my improved adaptor does not affect the outward size, shape or general appearance of the standard cartridge case. Moreover, the displacement of the all-over area in powder space will not reduce the pressures desired of this cartridge since a more potent powder may be substituted than is usually used in such cartridge cases, in addition to which the open face of the primer forwardly of the powder charge will also add to the potency thereof.

In Figures 11 to 17, inclusive, I have shown various modifications of my invention, particularly as to the means for securing in place the adaptor tube and striking pin. For instance, in Figure 11 I have shown a cartridge case 18 in which the outer face of the base thereof is provided with a seat 19 the lower portion of which is beveled or conically formed leading to an enlarged opening 20 communicating with the interior of the case. An adaptor tube 21, of a desired length and tapered as shown in the previously described form, is provided with a head 22 thereon the latter being also formed with a beveled under face to correspond with the beveled portion of the seat 19. This beveled portion of the head 22 connects with an enlarged neck portion 23 which fits snugly in the opening 20 and extends slightly within the interior of the case. The exterior of the tube 21 continuing from the neck portion 23 is threaded as shown at 24 for a portion of its length, said threaded portion being engaged by a nut 25. A tool, as shown in dotted lines by the numeral 25, may be introduced through the neck portion of the case to turn home the nut 25 against the internal shoulders of the base of the cartridge case, whereby the head 22 is tightly drawn into the seat 19, and between the inner face or shoulders of the base portion of said case and the nut 25 there is provided a gas check or seal 26.

The outer face of the head 21 is recessed as shown at 27 to receive therein the head 28 of the tapered striking pin 29 which extends through the tapered bore of the tube 21. This head 28 may be formed of the same material as the pin 29 or of a softer material to absorb the shock of the firing pin of the weapon, as desired. Of course, in this form of the invention, a projectile

is used in which the primer is carried in the heel or rear end thereof, as heretofore described.

In order to prevent casual displacement of the adaptor, the head 22 is dented, as shown at 30, to prevent turning of the head of the tube in the base of the cartridge case, and in order to retain the pin 29 in its proper inactive position normally within the tube 21, with the outer face of said head flush with the outer face of the base, the head 28 of the pin 29 is also dented as clearly shown at 31 in Figure 12 of the drawings. While I have shown this particular feature of densing the metal of these parts applied to the form illustrated in Figure 11 of the drawings, it will be understood that said feature will be utilized in connection with all forms of the invention.

In Figure 13 I have shown a further modification in which the cartridge case 32 has the outer face of the base thereof drilled with an opening to provide a seat 33 which has its inner portion beveled or conically formed, the beveled or conically formed portion leading to a threaded opening 34 which affords communication with the interior of the case. A tapered tube 35 of a desired length is provided which has a head 36 designed to fit the seat opening 33, said head being connected with a threaded neck portion 37 engaging the threaded opening 34 in the base of the cartridge case. A seal or gas check 38 is interposed between the beveled portion of the head 36 and the seat 33. The tapered striking pin 39 operating in said tapered tube is similar to the pin 29 in the form illustrated in Figure 11, having a head 40 thereon operating in a recess formed in the outer face of the head 36. The head 36 has recesses 36' formed therein to receive lugs of a tool or wrench 41, shown in dotted lines, whereby the adaptor tube may be readily secured in place in the cartridge case or removed, as and when desired.

In Figure 14 I have shown a still further modified form of the invention in which the cartridge case 42 is designed somewhat similar to the forms illustrated in Figures 11 and 13, with a slight variation in shape of the base opening. In this form a beveled opening 43 is provided to provide a seat in the outer face of the base which leads to a cylindrical opening 44 affording communication with the interior of the case. A tapered externally threaded adaptor tube 45 is provided which is shorter in length than the tubes illustrated in the previously described forms and this tube has a head 46 formed thereon and designed to snugly fit in the seat 43 and opening 44 of the case 42. A securing nut 47 is engaged with the threads of said tube 45 and a seal or gas check 48 is interposed between the inner face or shoulders of the base portion of the cartridge case and the nut 47. A tapered striking pin 48 operates through the tapered bore of the tubular adaptor 45 extending to a point within the cartridge case where it may, upon action of the firing pin of the weapon, actively engage the priming mixture carried in the heel of a projectile adapted to be supported in the neck portion of the case, in the manner heretofore described. In this form of the invention, the striking pin 48 is similar to the pin illustrated in the preferred form of the invention heretofore described and illustrated in Figures 1 to 10, inclusive. It will be understood, of course, if desired, the pin in this form of the invention may be provided with a head similar to that illustrated in Figures 11 and 13. The tube

may be of any desired length that may best accomplish the desired results.

In Figure 15 I have shown a further modification wherein the cartridge case 50 has the base portion thereof provided merely with an opening 51 leading from the outer face of said base to the interior of the case. The inner face of the base or the shoulders thereof are beveled as shown at 52 and these shoulders form a seat in the case. A tubular tapered adaptor 53 is provided wherein a head 54 formed thereon has a tubular outer projecting portion 55 adapted to snugly fit within the opening 51 and a lower flanged portion 56 the upper faces of which are beveled coincident to the beveling of the shoulders 52 against which same are seated. A seal or gas check 57 is interposed between the beveled flanged portion of the head 56 and the seat 52. This particular type of adaptor is introduced from the open end or neck portion of the cartridge case and tapped in place by a tool 58, shown in dotted lines, and is frictionally held in place. A tapered striking pin 59 operates through the tapered base of this adaptor tube, the pin in this instance being similar to that illustrated in Figures 11 and 13, in that it is provided with a head member 60 operating in a recess in the tubular portion 55 of the head member of the tube.

In Figure 16 I have shown a still further modified form of the invention which is somewhat of a combination of the forms shown in Figures 11 and 14 in that the cartridge case 61 has the outer face of the base portion thereof drilled to form a seat 62 leading to an opening 63 communicating with the interior of said case. A tapered tubular adaptor 64 is provided in which the head 65 is designed to fit the seat 62 and opening 63 and said tube is externally threaded, as shown at 66, for a portion of its length, there being a nut 67 engaged therewith which, when turned home, secures the adaptor in place within the cartridge case. Of course, a seal is interposed between the nut 67 and the inner face or shoulders of the base of the cartridge case providing a gas check. Obviously, in this form of the invention, as in the forms shown in Figures 11 and 14, the nut 67 is turned home through the medium of a tool projected into the cartridge case from the neck portion or open end thereof. A striking pin 68 operates through the tapered bore of the tube 64 and in this form of the invention, as in all forms heretofore shown and described, the striking pin is tapered, as is the interior and exterior of the tube, so that when said pin is driven to its actuating position, a positive seal is provided against the escape of powder gases, thus permitting said gases to give maximum effect in the propulsion of the projectile from the cartridge case.

In Figure 17 I have shown a still further modification of the invention wherein a cartridge case 69 has the base portion thereof formed with a seat and opening of the same design as that illustrated in Figures 1 to 7, inclusive, and wherein an adaptor tube 70 is provided which is similar in general structure and design to that form illustrated in Figures 1 to 10, inclusive, in that external cam members are provided on diametrically opposite points thereof to removably secure the tube in position in the case. The difference in this form of the invention over that illustrated in the preferred form, however, is in the taper of the tube and in the taper of the striking pin 71. Both the tube 70 and the pin 71 are tapered for a portion of their lengths to a point adjacent

the outer ends thereof. From this point, which is designated by the numeral 72, onto the free ends of each of said elements 70 and 71 the walls or faces are parallel. The particular formation of the taper extending merely for a portion of the length of each of the tube and pin is believed to more effectively seal or fuse the two elements together, when the striking pin has been driven forwardly by the firing pin of the weapon, to prevent the escape of powder gases through said tube.

Likewise, in this form of the invention, I have illustrated at the rear striking end of the pin 71 a buffer head 73 which may be of any material softer than the pin 71 to absorb the shock of the firing pin of the weapon. As a matter of fact, this form of shock absorption may be applied to all forms of the invention, if desired.

In Figures 18, 19 and 20 I have shown different forms of projectiles with the recesses in the heels thereof for the reception of the priming mixtures. In Figure 18 I have shown a projectile 74 which is known as a tracer and the primer 75 is sealed by the aforementioned cellulose preparation in a recess of the heel thereof. In Figures 19 and 20 the projectiles which are of the boat-tail type are designated, respectively, by the numerals 76 and 77. They are more or less similar except that in Figure 19 I have shown a substantially rectangular recess for the reception of the sealed open faced primer 78 while in Figure 20 I have shown a recess in which the base of the projectile is provided with a concaved recess for the reception of the primer sealed 79. In each instance of the projectiles illustrated in Figures 18 to 20, inclusive, however, the walls of the recesses receiving the priming charges are coated with the cellulose preparation and the open faces of the priming mixtures are also coated with the cellulose preparation, in the manner heretofore described.

In Figure 28 of the drawings I have illustrated on a fairly enlarged scale a fragment of a projectile of the boat-tail type in which a recess has been formed by the spreading out of the heel portion of the jacket thereof and the walls of the recess coated with the cellulose preparation designated in this instance by the numeral 80. The priming mixture 81 is introduced in the recess and the cellulose preparation applied thereto to form a covering 82. The outer face of the priming mixture is somewhat concaved which obviously increases the thickness of the coating 82 applied thereto. This coating 82 is pliable and resilient and will withstand the normal pressure thereagainst of the striking pin acting as a cushion for the latter when the projectile is introduced into the cartridge case in assembling the device.

In Figures 21 to 27, inclusive, I have shown projectiles for use in cartridge cases with my improved primer embodied therein or about to be placed therein. In Figure 21, for instance, I have shown what is generally known as a boat-tail solid projectile comprising the outer jacket or casing 83 and the lead or other filling 84, said jacket or casing being designed at its heel or rear end to permit a circular concaved portion 85 of the filling 84 to be revealed. The numeral 86 designates a tamping tool or plunger (shown in dotted lines) which is used to force the filling 84 inwardly from the open end 85 thereof to form a recess 87 (shown in dotted lines) which provides the pocket in the heel or rear end of the projectile for reception of the priming mixture.

Thus, this recess or pocket may be formed without removal of any material forming the filling and without appreciably disturbing the balance of the projectile.

In Figure 22 I have shown a similar boat-tail solid projectile 88 in which a recess or pocket 89 is formed in the tail or heel of the projectile by drilling or otherwise similarly removing the material therefrom. The first step in the filling of the primer in this recess 89, or in the recess 87 of the form shown in Figure 21, is to coat the walls of said recess, preferably by spraying, with the cellulose preparation 90, as clearly shown in Figure 23, and as previously described in connection with the form shown in Figure 28 of the drawings. Thereupon, there is introduced a layer of priming mixture 91 of the slow burning quality. Then applied to this layer 91 is a second layer 92 of priming mixture of the concussion quality. The outer face of the latter layer is slightly concaved as best illustrated in Figure 25 of the drawings, and then the outer face of this fast burning mixture is coated with a layer 93 of the cellulose preparation. This latter layer is resilient and somewhat spongy and will absorb slightly the stress of the projecting end of the striking pin 94 in the normal position of the latter when the projectile is assembled in the cartridge case. This position of the striking pin with respect to the coated priming mixtures is best illustrated in Figure 26 of the drawings.

In Figure 27 I have shown a slightly modified form of projectile which is known as the tracer type, wherein the jacket 95 has the filling 96 in the forward portion thereof, a powder 97 rearward thereof which produces a flame in the dark and a smoke in daylight to trace the flight thereof. A space or pocket is formed in the heel or rear end of the projectile, just rearward of the powder 97, the walls of which are coated, as in the previously described forms, with the cellulose preparation 98, whereupon the two layers 99 and 100 of priming mixtures, respectively slow and fast burning, are supplied and the outer face thereof coated, as shown at 101 with the cellulose preparation.

In all of these forms of projectiles heretofore shown and described, the priming mixture may be said to be open faced, so that the most direct, the hottest and the maximum amount of flame may be furnished the gun powder or other powders used in the cartridge case. In the forms of the invention illustrated and described in connection with Figures 21 to 27, inclusive, dual priming mixtures are provided, so that all powder within the cartridge case may be burned within the barrel of the weapon to produce the maximum pressures for effectively propelling the projectile. Whereas, in weapons of present day use, powders are found to be frequently unexpended, the arrangement in the heel of a projectile, such as I have herein provided, of a primer, consisting of layers of both fast and slow burning mixtures, will overcome this condition and thus produce maximum results.

The use of a cellulose coating for the walls of the recess or pocket containing the priming mixture and the coating of the outer face of the latter will prevent deterioration of said mixture either from contact with the atmosphere or metals of which the projectile is formed. Moreover, the use of a cellulose preparation as a coating will permit said coating to be entirely burned with the burning of the mixtures, so that when the projectile is propelled from the barrel of the

weapon, the walls of the recess therein will be clean and free of any residue. Thus, the true balance of the projectile in flight will not be affected.

While in the various forms of the invention heretofore described and shown in the drawings, I have illustrated an elongated striking pin supported in an elongated adaptor tube, it will be understood, however, that the length of the tube may be varied and a reasonably short tube provided, so long as the same forms a guide for the striking pin and has a sufficiently tapered bore to correspond with a taper on the pin to form a positive seal or check against the escape of gas pressures through the rear of the cartridge case. It is preferable, of course, that the adaptor tube be removably mounted in position within the cartridge case, so that when the latter has been used to the maximum extent, which may be an indeterminate number of times, said tube and the striking pin may be removed for application to a fresh cartridge case, but if desired, the tube may be permanently secured to the case.

I have heretofore emphasized the fact that my invention is particularly adapted for use in connection with expended cartridge cases whereby these cases may be collected or retrieved as used and reloaded, and thus used indefinitely. It will be understood, however, that my invention is equally well adapted for use in connection with originally manufactured cartridge cases, in which instance the cases would be originally bored at the base thereof to receive the head of the adaptor tube which may be removably secured in place in any of the various ways heretofore described and shown in the drawings hereof, or as previously stated, permanently secured in place therein.

I do not wish to be limited as to the character of material to be used in the formation of the adaptor tube and striking pin, nor do I wish to be limited as to the length of the tube, diameter of the bore thereof or the angularity of the taper of said tube and the striking pin, as these features may be varied according to conditions, circumstances and desires of the manufacturer or user, so long as the primer may be ignited upon the movement of the pin to a predetermined position and a positive seal or check produced between the pin and the tube to prevent the escape of gas pressures.

From the foregoing description of the construction of my improved cartridge, the method of manufacture and operation thereof will be readily understood and it will be seen that I have provided a comparatively simple, inexpensive and efficient means for carrying out the numerous objects of the invention. While I have particularly described the elements best adapted to perform the functions set forth, it is understood that various changes in form, proportion and in the minor details of construction may be resorted to, without departing from the spirit or sacrificing any of the principles of the invention.

I claim:

1. In a cartridge, a case having an opening in the base thereof, a movable striking member operating through said opening within said case, a powder charge surrounding said member, a projectile mounted in the end of said case, a primer carried by the rear end of said projectile and adapted to be ignited by the plunging thereagainst of said movable member, and a sleeve about said striking member, portions of the sleeve and the striking member being tapered forwardly

and having wedging fit as the striking member moves forwardly to form a tight joint and prevent escape of gas pressure through the opening in the base of said case.

2. In a cartridge, a case having an opening in the base thereof, a striking member movable longitudinally through said case and supported in said opening, a powder charge surrounding said movable member, a projectile mounted in the outer end of said case, a primer at the rear end of said projectile and adapted to be ignited and effective upon the plunging thereto of said movable member, and a sleeve in said case slidably receiving said striking member and having wedging fit about the same upon its movement to an actuating position to check the escape of gas pressures through the opening in said base.

3. In a cartridge, a case having an opening in the base thereof, a striking member movable longitudinally of said case and supported in said opening, a powder charge in said case surrounding the movable member, a projectile mounted in the outer end of said case, a priming mixture recessed in the rear end of said projectile and openly facing the outer striking end of said movable member in alinement with the latter, and a sleeve passing through said opening and extending longitudinally in said casing, said striking member slidably passing through said sleeve and when shifted forwardly to strike and explode said priming mixture having a portion tightly wedged in the sleeve for checking the escape of gas pressures through said opening.

4. In a cartridge, a case having an opening in the base thereof, a tubular supporting member mounted in the opening of said base and projecting into the case, a striking pin movable longitudinally through said case and supported in said tubular member, a powder charge surrounding said tubular member and pin, a projectile mounted in the outer end of said case, a primer recessed in the rear end of said projectile and adapted to be ignited by the plunging of said pin thereto, and said striking pin having wedging fit in the tubular member to form a tight seal and check escape of gas pressure during movement of said striking pin to its actuating position.

5. In a cartridge, a case having an opening in the base thereof, a tubular supporting member passing through the said opening and extending into the case, cam members carried by said tubular member in position for engaging the inner face of the base and firmly securing the tubular member when the tubular member is turned in one direction in the opening, a striking member movable longitudinally through said tubular member into the interior of said case, a powder charge in said case surrounding the tubular member and striking member, a projectile mounted in the outer end of said case, a primer recessed

in the rear end of said projectile and adapted to be ignited by said movable member upon the plunging of the latter thereto, and means formed on said tubular member and movable member coacting to check the escape of gas pressures upon the movement of said movable member to its actuating position.

6. In a cartridge, a case having an opening in the base thereof, a tubular supporting member supported in the opening of said base and projected into the interior of said case, the bore of said tubular member being tapered, a striking pin movable through said tubular member and adapted to be projected into the case beyond said tubular member, a powder charge surrounding said tubular member and pin, a projectile mounted in the outer end of said case, a priming mixture carried at the rear end of said projectile and adapted to be ignited upon the plunging thereto of said striking pin, said striking pin being tapered in a predetermined manner to limit the forward movement thereof with respect to the tapered bore of said tubular member and check the escape of gas pressures when said striking pin has been moved to its actuating position.

7. In a cartridge, a case having an opening in the base thereof, a tapered tubular member removably mounted in the opening of said base and extended therewithin, a projectile mounted in the outer end of said case, a powder charge in the case surrounding said tube, a primer mounted in the rear end of said projectile, and a tapered striking pin movable longitudinally in said tube having one end thereof normally terminating at the base end of said tube and the opposite end thereof terminating in alignment with and just rearward of said primer, the tapering of said tube and pin limiting the forward movement of the latter for checking the escape of gas pressures when said pin has been moved to its actuating position.

8. In a cartridge, a case having an opening of the base thereof, a tapered tubular member within said case, means for removably mounting the rear end of said tube in the opening of said base, a projectile mounted in the front end of said case, a powder charge within said case surrounding said tube, a primer mounted in the rear end of said projectile in alignment with said tube, and a tapered striking pin movable longitudinally of said tube, the rear end of said pin terminating normally at the base end of said tube and the opposite end of said pin terminating just rearward of the primer, the tapering of said tube and pin limiting the forward movement of the latter whereby the escape of gas pressures may be checked upon the movement of said pin to its effective actuating position.

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