No. 1807

DESCRIPTION OF French Percussion Detonating Fuze

24/31 TYPE IA.

Translated from the French

By the

Gun Division, Ordnance Department

AUGUST 18, 1917

WASHINGTON
GOVERNMENT PRINTING OFFICE
1917

TRANSFORMATION UNITS.

1 meter (m.)..... = 39. 37 inches.
1 centimeter (cm.) = 0. 3937 inch.
1 millimeter (mm.)= 0. 03937 inch.
1 kilogram (kg.)....= 2.2046 pounds.
1 dekagram (dkg.).= 0. 3527 ounce.
1 gram.....=15. 432 grains.
1 yard.....= 0. 9144 meter.
1 foot.....= 0. 3048 meter.
1 inch.....= 2. 54 centimeters.
1 square inch.....= 6.452 square centimeters.
1 cubic inch.....=16. 39 cubic centimeters.
1 cubic foot.....= 0. 02832 cubic meter.
1 cubic yard.....= 0. 7646 cubic meter.
1 ounce.....=28. 35 grams.
1 pound.....= 0. 4536 kilogram.

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(Translation.)

MINISTER OF ARMAMENT
AND OF
MANUFACTURE OF WAR.

APRIL 11, 1917.

NOTICE

RELATIVE TO

PERCUSSION DETONATING FUZES, 24/31, TYPE IA.

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NOTICE.

The percussion detonating fuzes 24/31 of Type IA include:

The percussion detonating fuze—

24/31 IA[1] Model 1915 { noncolored head. / with red head.

24/31 IAL[2] Model 1916 { noncolored head. / with red head.

These fuzes are intended to arm the projectiles closed by a booster cup.

They can equally well be utilized for projectiles closed by a sheath of Model 1895, on condition that this sheath is supplied with a special relay cartridge of 147 millimeters and with a wedge ring.

They are put in place by simply screwing with the hand.

The fuzes IA are not supplied on the exterior with any wedge washer.[3]

The fuzes IAL should, on general principle, be supplied with a felt wedge washer, threaded on the detonator casing, and glued on with gum-lac varnish. This washer is not indispensable; it has the advantage

[1] IA signifies "instantaneous elongated."

[2] IAL signifies "instantaneous elongated, Lefevres." The construction of this fuze is in part the result of the work of Mr. Andre Lefevre, auxiliary engineer of powder, on the transmission of the detonation of primers at a distance.

[3] The disposition of the stem of the fuze IA does not lend itself to the use of a wedge washer, the lower part of the fastening ring of the booster being too far away from the shoulder of the booster cup plug.

of causing, at the end of the screwing, a pressure which contributes to the fixity of the fuze, and of bringing back or reflecting a part of the effort of pulling out from the detonator casing on the booster cup.

The fuzes of type I.A are characterized by the elongated form of their head, which, when the fuze is mounted on the projectile, projects about 12 centimeters out of the sheath.

This disposition was adopted to increase the instantaneousness of functioning, which occurs, with these fuzes, before the pointed part of the projectile has reached the ground.

The construction of the different fuzes of type I.A are given in the following chapters.

NOTE.—The dismounting of the fuze is absolutely forbidden. All fuzes which, in spite of this instruction, might have been dismounted should be destroyed.

It is dangerous to manipulate or to fire a fuze which has been dismounted.

The following recommendations should, moreover, be observed in the manipulation and use of fuzes of type I.A:

(*a*) While the fuze has its fuze cover removed, do not touch any of its uncovered parts, and particularly the brass spiral.

(*b*) Be sure, before using, that this spiral is well in place and that it has not been removed in the operation of removing the fuze cover. All fuzes without spiral should be destroyed or sent back to the artillery park.

(*c*) Make sure (fuze I.A, Model 1915) that the fastening ring is perfectly immobile and that the booster itself can not turn with reference to the fuze. All fuzes, the fastening ring or the booster of which can be moved with the hand should be sent back to the artil-

lery park to be sent to the central pyrotechnical school.

(*d*) If, at the end of the firing, a projectile armed with a fuze with fuze cover removed has not been fired, unscrew the fuze and set aside to be sent back to the artillery park.

(*e*) To unload a piece containing a projectile supplied with a fuze of type IA, in default of special apparatus, place between the projectile and the ramrod an emergency muff made of wood, 30 centimeters high, and having an exterior diameter the same as that of the head of the ramrod, and which has on the interior a cylindrical bore sufficient to surround the fuze.

19637°—17——2

NOTICE RELATIVE TO PERCUSSION DETONATING FUZES, 24/31, TYPE IA.

Chapter I.

PERCUSSION DETONATING FUSES, 24/31 IA, MODEL 1915, WITH NONCOLORED HEAD.

(Pl. I.)

(a) EXTERIOR.

The head of the fuze is covered over at its upper part with a tin covering, under which is found a ribbon of tarred tape.

The head of the fuze consists of the following parts:

Firing-pin head (steel).[1]

The spiral (composed of a brass tape wrapped several times around the plunger and terminated by a weight of brass).

The supporting washer (steel).

The cap (steel) through which project the extremities of the safety pin (steel).[2]

The upper cylindrical part of the body of the fuze (brass).[3]

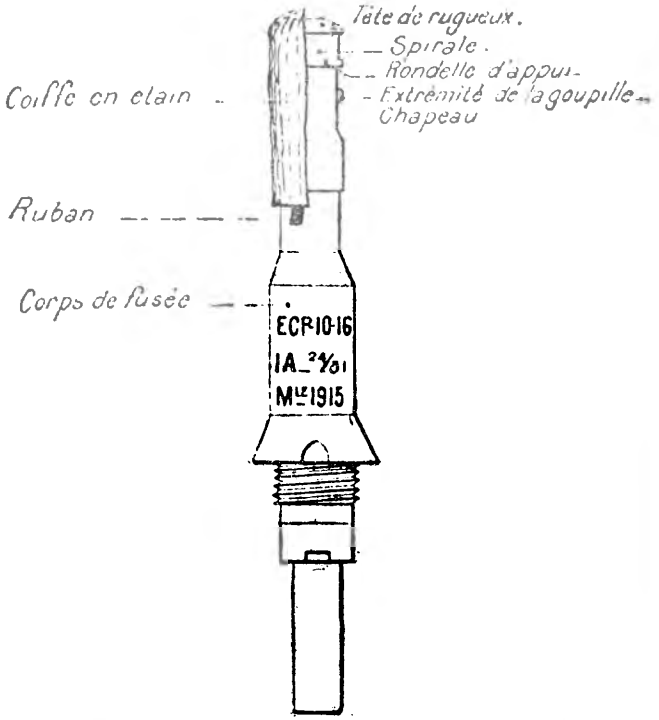
[1] In the fuzes of older make the head of the firing pin has a screwing slit and is less in size than the head of the firing pin of fuzes of late manufacture.

[2] The safety pins of fuzes of older manufacture are of brass.

[3] It was constructed from fuzes with bodies of steel.

Moreover, a washer called a "shock washer" is interposed between the spiral and the head of the firing pin.

PARTIE SUPERIEURE DE LA FUSEE ET MARQUES DISTINCTIVES.



UPPER PART OF FUZE AND DISTINGUISHING MARKINGS.

Coiffe en étain	Tin fuze cover.
Ruban	Tape.
Corps de fusée	Fuze body.
Tête de rugueux	Head of firing pin.
Spirale	Spiral.
Rondelle d'appui	Supporting washer.
Extrémité de la goupille	End of safety pin.
Chapeau	Cap.

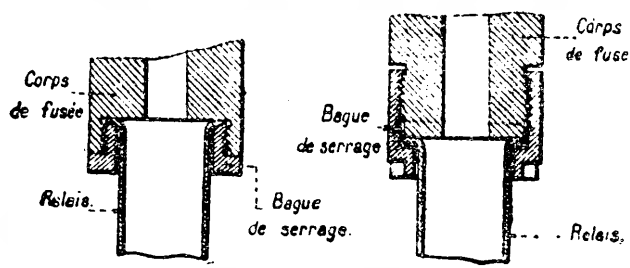
The tarred tape which is found under the fuze cover is wound three times around the cap of the fuze inversely to the winding of the spiral, the first round on the lower part of the cap, the second on the extremities of the safety pin, the third on the spiral.

The median part of the body of the fuze (brass) is made of a cylindrical part of diameter greater than the upper part. This median part is extended by a truncated part beneath which is a threading according to the requirements of the tapping and of the booster casing.

The stem is formed of the brass booster fixed to the body of the fuze by the fastening ring.[1]

This fastening ring is tightened on the body of the fuze after it is put in place.[2]

[1] The method of uniting the fastening ring and the body of the fuze is different in fuzes of older makes and those of later designs. The booster is, moreover, thicker in the fuzes of the later models than in those of older manufacture.



ANCIENNE FABRICATION, OLDER MANUFACTURE—NOUVELLE FABRICATION, NEW MANUFACTURE.

Corps de fusée——Fuze body.
Relais——Booster.
Bague de serrage——Fastening ring.

[2] In the fuzes of older manufacture, the fastening ring is fixed in position only by two strokes of the prick point.

The booster cup contains a charge of melinite designed to constitute a primer booster. It penetrates into the stem of the plug of the booster casing.

(b) INTERIOR.

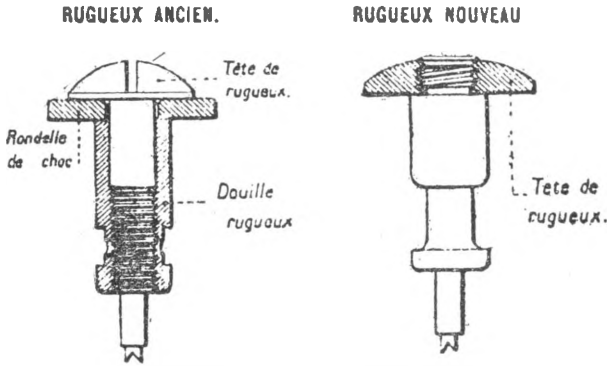
Three principal parts:

The compression apparatus.
The safety lock.
The detonator.

First. The compression apparatus comprises—

The *firing pin*, formed of a piece of steel terminated at its lower part by four points of a pyramidal form and at its upper part by a head either screwed[1] or riveted.

[1] In fuzes of older make the body of the firing pin is screwed in an aluminum socket and has a head of reduced dimension, beneath which is placed a washer called a shock washer.



Rugueux ancien_____Old firing pin.
Rondelle de choc_____Shock washer.
Tête de rugueux_____Head of firing pin.
Douille de rugueux_____Firing pin socket.
Rugueux nouveau_____New firing pin.
Tête de rugueux_____Head of firing pin.

The firing pin carries in its median part a groove at the lower part of which is the safety pin hole; it has in its upper part a slot which serves for the seat of the tightening spur of one, of the half rings (see further on);

The *primer holder* in which is carried the fulminate primer; over this primer is found a washer of brass of 0.3 millimeter thick and a threaded plug fastened by three blows of the prick punch. This plug is pierced by a central hole for the passage of the point of the firing pin. The primer holder is held in place by the pressure of the cap screwed on to the body of the fuze;

The *safety pin*, made of steel,[1] which traverses the firing pin and the cap and unites these two pieces the one with the other.

Second. *Safety lock.*—It comprises—

The two half rings of steel, one of which has on the interior a tighting spur;

The *spiral*, formed by a thin brass ribbon terminated by a weight uniting with the ribbon.[2] This weight carries a mark formed by a notch. The spiral is wound around the two half rings, as indicated by the diagram on page 16.

It is then mounted on the firing pin in such a fashion that the mark formed by the notch of the weight is in contact with the supporting washer and that the impulse spur is put in its seat.

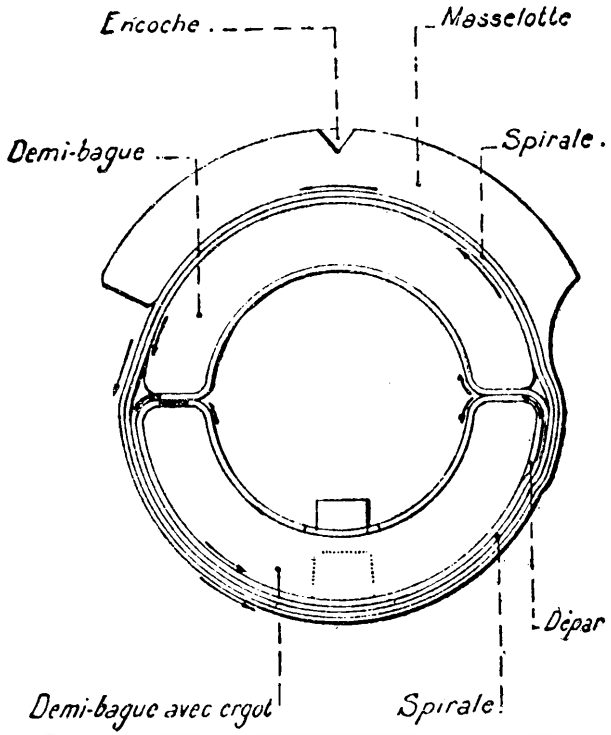
The *supporting washer* threaded on the firing pin below the spiral.

NOTE.—The unrolling of the spiral is prevented, during transportation, by the presence of the fuze cover. In fuzes of late

[1] See note 2, p. 11.

[2] In the spirals of older makes, the weight is attached and held by soldering at the extremity of the ribbon.

Spirale enroulée.



SPIRALE ENROULÉE—SPIRAL VOLUTION.

Encoche	Notch.
Demi-bague	Half ring.
Masselotte	Weight.
Spirale	Spiral.
Demi-bague avec ergot	Half ring with spur.
Départ	End of spiral.

manufacture the spiral is reheated after mounting to destroy the hardening produced by the mounting and to prevent all beginning of unrolling by elasticity of metal.

Third. *Detonator.*—It comprises—

The *short detonator with flange* of copper, which contains 2 grams of fulminate of mercury compressed; the fulminate is maintained by a supporting tube of copper which is itself made fast by crimping and wedged at the lower part by a felt washer.

At the lower part of the supporting tube is pierced the hole for transmission of fire, closed by a cloth washer, lined with a tin washer.[1] This tin washer is used to avoid all possibility of sifting of the fulminate.

At the interior of the supporting tube is placed a compressed powder pellet designed to reinforce the action of the fulminate primer at the moment of the firing.

The *detonating core*, composed of a tube of tin filled with melinite. The upper extremity of this core is beneath the primer. It traverses the entire body of the fuze and penetrates to the bottom of the relay. This core is surrounded at its upper part by a ring formed by bringing nearer together the extremities by a bit of detonating core 25 millimeters in length. This ring, as well as the upper extremity of the detonating core, is compressed in its seat after being put in place.

The *relay* is composed of a socket of brass stamped and drawn out. The socket is fastened to the body of the fuze by the fastening ring[2] and contains 4 grammes of pulverized melinite compressed at 80 kilogrammes

[1] The tin washer does not exist in the fuzes of older manufacture.
[2] See note 1, p. 13.

to the square centimeter. This melinite has in its central part a cylindrical boring out into which penetrates the detonating core.

(c) OPERATION.

The fuze cover is removed only at the time of its use. At the time of firing the presence of the half rings between the head of the firing pin and the supporting washer prevents the firing pin reaching the primer, even in case of accidental cutting of the safety pin.[1]

The half ring with spur participating in the rotary movement of the projectile carries along with itself the extremity of the spiral to which it is fixed.

The spiral, being given the direction of its winding and that (to the right) of the rotational movement,[2] carries along the weight in this movement by tightening around the half rings.

When the centrifugal force becomes sufficient, the weight draws away from the axis of the projectile by causing an unwinding of the spiral, which frees the half rings and permits them to break away.

When the half rings have escaped, which occurs on the outside of the bore, the firing pin is no longer supported except by the safety pin. This latter shears at the point of falling if the angle of fall is sufficient for the head of the fuze to meet the ground. The point of the firing pin then meets the fulminate primer.

The fire of the latter is transmitted by the compressed powder pellet to the short primer of 2 grams of fulminate, which detonates.

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[1] The steel safety pin of fuzes of late make resists generally the firing in the 75 mm. cannon with the normal charge, even when the spiral and the half rings are not in place.

The conditions of the firing of 75 mm. cannon with explosive projectiles correspond to the strongest reactions that the fuzes have to bear.

[2] The noncolored head fuze is not fired except when the cannon is rifled to the right.

The detonating core transmits this detonation instantaneously to the melinite which is in the relay, which in turn detonates, provoking the detonation of the explosive in the booster casing and of the charge of the projectile.

(d) CONDITIONS OF ACCEPTANCE.

The proofs of acceptance require principally two firings on natural ground at the firing distance of 4,000 meters, one with a charge of 0 kilogram 700 BSP, the other at the gauge pressure of 2,600 kilograms. The proportion of those which miss fire should not be above 7.5 per cent.

(e) CONDITIONS OF ARMAMENT.

Experience proves that the unrolling of the spiral is obtained in cannons rifled to the right only for a speed of rotation above 3,000 revolutions to the minute.[1]

This number of revolutions corresponds to a projectile of 155 mm., fired in a cannon rifled to the right at 7° at initial velocity of about 200 meters.

The IA fuze, Model 1915, can be used in cannon of 155 short Model Schneider and Saint-Chamond and in cannons of 155 long. These guns are rifled to the right at 7°, but the initial velocity which they use is greater than 200 meters.

It is not used in cannons of 155 short, model 1881 or 1890 or 1904 TR or 1881–1912 because the guns which are rifled at 7° to the right utilize charges 4 to 7 which give velocities less than 200 meters. In these cannons we make use of the fuze IA with red head.

[1] The number of revolutions to the minute of a projectile is computed approximately by the formula—

$$N=\frac{60\times V_0\times tgi}{\pi\times C}$$

where V_0 represents the initial velocity in meters, tgi the tangent of inclination of the rifling on the axis of the cannon at the muzzle, C the caliber expressed in meters.

Chapter II.

PERCUSSION DETONATING FUZE 24/31 IA, MODEL 1915, WITH RED HEAD.

(Pl. I.)

(a) EXTERIOR.

The exterior is the same as that of the fuze with noncolored head, except that the notch of weight instead of being in contact with the supporting washer, is in contact with the head of the firing pin. From this fact the direction of the volution of the spiral mounted upon the firing pin is inverse to the direction of the volution of the spiral of the fuse with noncolored head.

(b) INTERIOR.

In the interior the fuze is identical with the fuze with noncolored head.

(c) OPERATION.

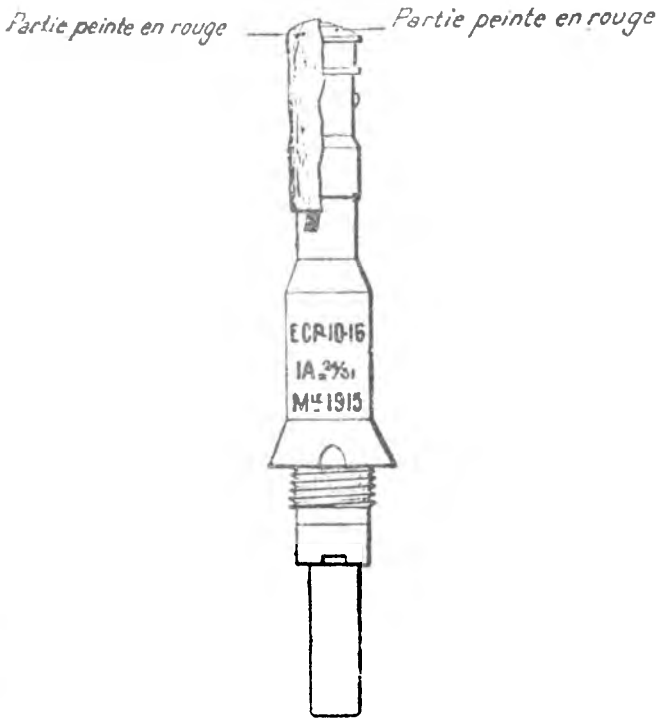
The function of the fuze with red heat fired in cannons rifled to the left is the same as that of fuzes with noncolored head fired in cannons rifled to the right. This arises from the fact that the direction of volution of the spiral is inverse.

When the fuze with red head is used in cannons of 155 short, model 1881 or 1890 or 1904 TR or 1881–1912, which are rifled to the right, the functioning is as follows:

At the moment of firing, the presence of the half rings between the head of the plunger and the supporting washer prevents the firing pin reaching the primer, even in case of accidental cutting of the safety pin.

The half ring with spur participating in the rotary movement of the projectile carries along with it the extremity of the spiral to which it is fixed.

MARQUES DISTINCTIVES.



MARQUES DISTINCTIVES—DISTINGUISHING MARKS.

Partie peinte en rouge_____Part painted red

The spiral, by reason of the direction of its volution and of that (to the right) of the movement of rotation, loosens itself around the half rings while unrolling.

When this loosening is sufficient the half rings are liberated and escape.

The spiral also escapes.

The escaping of the half rings takes place on the outside of the bore, but nearer to the muzzle of the piece than for fuzes with noncolored head fired in guns rifled to the right.

When the half rings have escaped the fuze acts and functions on impact under the same conditions as the fuze with noncolored head.

(d) CONDITIONS OF ACCEPTANCE.

The tests of acceptance comprise—

(*a*) A firing at 4,000 meters in the 95 mm. cannon rifled to the left with a charge of powder, BC, developing a gauge pressure of 2,300 kilograms.

(*b*) A firing in the cannon of 155 short with an angle of fall in the neighborhood of 25° with the practice charge No. 7. The proportion of misses should not be greater than 10 per 100.

(e) CONDITIONS OF ARMAMENT.

The fuze with red head is used in cannons rifled to the left for velocity of rotation greater than 3,000 minute turns.[1]

The number of minute turns, minimum, causing its arming in the cannons rifled to the right, has not been determined. It is probably very small,[2] and at all events less than 2,000. This fuze is used principally with all charges in cannons of 155 short, model 1881, or 1890, or 1904 TR, or 1881–1912.

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[1] See note 1, p. 19.

[2] The centrifugal force does not appear to intervene in the functioning in the case of cannons rifled to the right.

CHAPTER III.

PERCUSSION DETONATING FUZE 24/31 IAL, MODEL 1916, WITH NONCOLORED HEAD.

(Pl. 2.)

(a) EXTERIOR.

The exterior is the same as that of the detonating fuze 24/31 IA, Model 1915, with noncolored head, except in so far as concerns the lower part of the fuze.

This lower part, instead of being formed by a relay held by a fastening ring, is formed by a detonator socket screwed on the body of the fuze.

The body of the fuze is, besides, a little longer than in the detonating fuze 24/31 IA, Model 1915.

(b) INTERIOR.

In the interior the fuze differs from the fuze IA, Model 1915, with noncolored head only in the construction of the detonator.

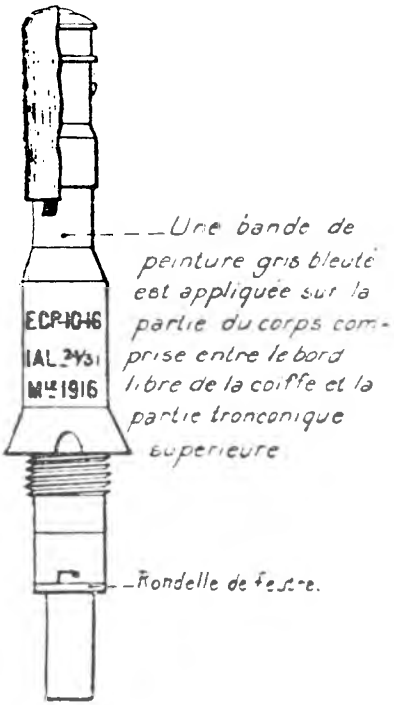
The short primer with flange lies directly upon the base of its cavity. There is neither detonating core nor detonating core ring. The central canal of the body of the fuze is empty.

The relay and its fastening ring are replaced by a detonating socket.

This detonating socket is identical with the detonating sockets used with the fuzes of type Model 1899. It contains a detonator with flange of ordinary type. This detonator is made in the same way as the short primer with flange is made, but its height is greater. Besides the supporting tube is full instead of being

pierced by a hole for firing, closed with a cloth washer lined with tin.

MARQUES DISTINCTIVES.



MARQUES DISTINCTIVES—DISTINGUISHING MARKS.

A band of bluish gray paint is applied to the part of the body comprised between the free edge of the fuze cover and the upper truncated portion.

Rondelle de feutre—Felt washer.

NOTE.—The advantages which the fuze IAD presents over the fuze IA from the point of view of its construction come from the omission of the detonating core. It has been estab-

lished that the detonating core could, in case of firing with high coefficients of acceleration, suffer a setback at the time of firing sufficiently great to burst the relay. This defect is avoided with the construction of the fuze IAL.

(c) FUNCTIONING.

The functioning is the same as that of the detonating fuze 24/31 IA, Model 1915, with noncolored head, except as regards the functioning of the detonator. The detonation of the short primer with flange is transmitted directly without any intermediate agent through the central canal of the fuze to the primer with flange of the ordinary type located in the detonator socket.

The detonation of this detonator causes the detonation of the explosive of the booster casing and of the charge of the projectile.

(d) CONDITIONS OF ACCEPTANCE.

The conditions for acceptance are exactly the same as those of the fuze IA with noncolored head.

(e) CONDITIONS OF ARMAMENT.

The conditions of arming are equally the same as those of the fuze IA with noncolored head.

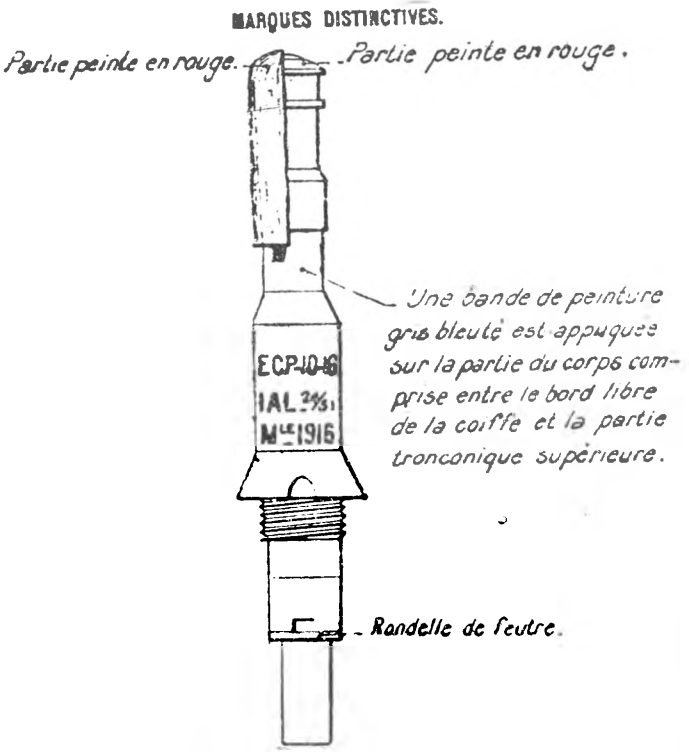
Chapter IV.

PERCUSSION DETONATING FUZE 24/31 IAL, MODEL 1916, WITH RED HEAD.

(Pl. 2.)

(a) EXTERIOR.

The exterior is the same as that of the fuze IAL with noncolored head, except that the notch of the weight



MARQUES DISTINCTIVES—DISTINGUISHING MARKS.

Partie pointe en rouge—Part painted red.
A band of bluish gray paint is applied to that part of the body lying between the free edge of the head covering and upper truncated part.
Rondelle de feutre—Felt washer.

instead of being in contact with the supporting washer is in contact with the head of the firing pin as in the detonating fuze 24/31 IA, Model 1915, with red head.

From this fact the direction of the volution of the spiral mounted upon the plunger is inverse to the direction of the volution of the spiral of the fuze with noncolored head.

(b) INTERIOR.

On the interior the fuze is identical with the fuze IAL with noncolored head.

(c) FUNCTIONING.

The functioning is the same as that of the fuze IA with red head in so far as concerns the compression and the safety lock.

The functioning of the detonator is the same as that of the fuze IAL with noncolored head.

(d) CONDITIONS OF ACCEPTANCE.

The conditions for acceptance are exactly the same as those of the fuze IA with red head.

(e) CONDITIONS OF ARMAMENT.

The conditions of armament are equally the same as those of the fuze IA with red head.

PARIS, *April 4, 1917.*

F. GOSSOT,

General of Division, Inspector of Studies and Technical Experiments of the Artillery.

Approved:

PARIS, *April 11, 1917.*

For the minister and by his order the general in charge of the Artillery,

E. RONNEAUX.

Plate I.

FUSÉE-DETONATEUR PERCUTANTE DE 24/31 IA MLE. 1915—PERCUSSION DETONATING FUZE 24/31 IA, MODEL 1915.

Tête de rugueux	Head of firing pin.
Spirale	Spiral.
Demi-bague	Half-ring.
Rondelle d'appui	Supporting washer.
Bouchon fileté	Threaded plug.
Rondelle de feutre	Felt washer.
Porte amorce	Detonator socket.
Amorce courte à collerette (2 gr. de fulminate).	Short primer with flange (2 grams of fulminate).
Corps de fusée	Body of fuze.
Bague de serrage	Fastening ring.
Relais	Relay.
Partie colorée en rouge dans la fusée a tête rouge.	Part colored in red in fuze with red head.
Massellotte	Weight.
Rugueux	Firing pin.
Goupille	Safety pin.
Chapeau	Cap.
Rondelle	Washer.
Amorce fulminate	Fulminate primer.
Grain de poudre	Powder pellet.
Anneau en cordeau detonant	Ring of detonating core.
Cordeau detonant	Detonating core.
Melinite	Melinite.

PL. 1.

FUSEE-DETONATEUR PERCUTANTE DE 24 31 IA Mle 1915.

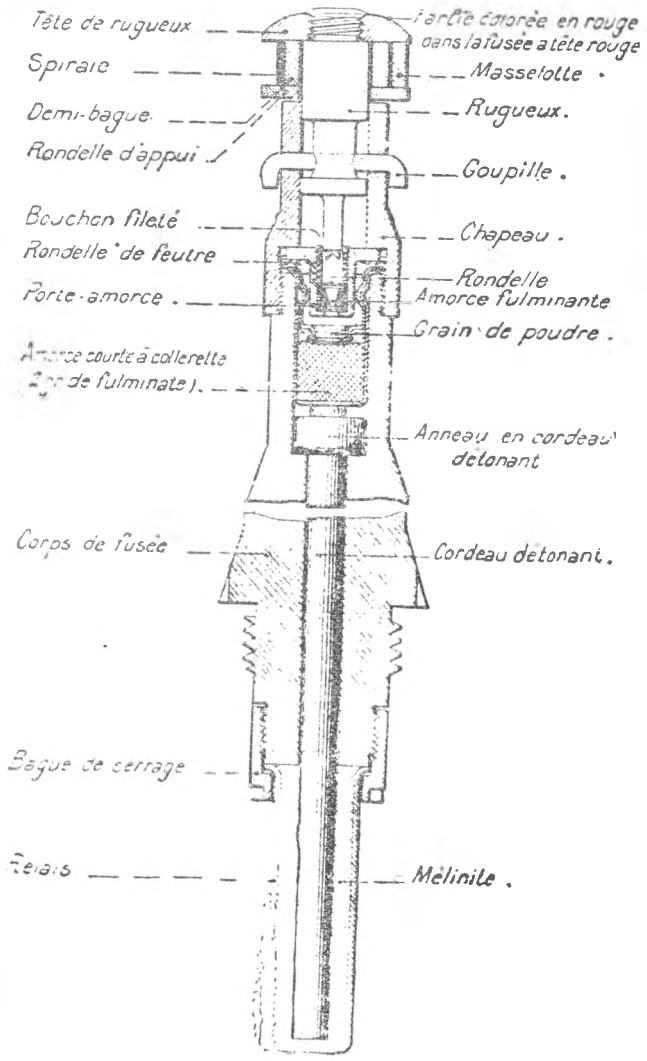


PLATE II.

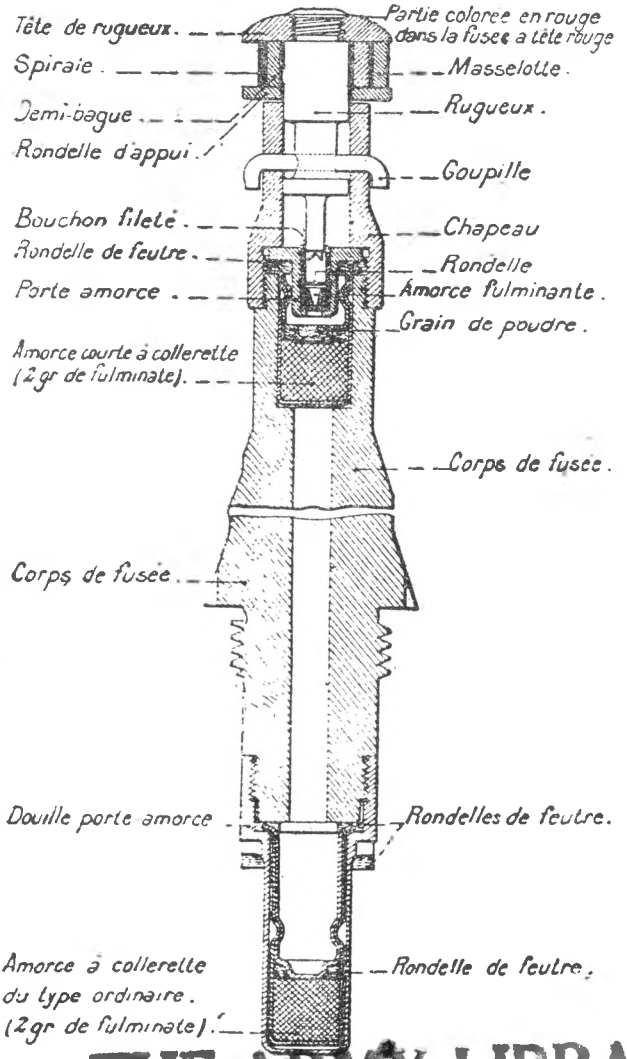
FUSÉE-DETONATEUR PERCUTANTE DE 24/31 IAL MLE. 1916—PERCUSSION DETONATING FUZE 24/31 IAL, MODEL 1916.

Tête de rugueux	Head of firing pin.
Spirale	Spiral.
Demi-bague	Half-ring.
Rondelle d'appui	Supporting washer.
Bouchon fileté	Threaded plug.
Rondelle de feutre	Felt washer.
Porte amorce	Detonator socket.
Amorce courte à collerette (2 gr. de fulminate).	Short primer with flange (2 grams of fulminate).
Corps de fusée	Body of fuze.
Douille porte amorce	Detonator socket.
Amorce à collerette du type ordinaire (2 gr. de fulminate).	Primer with flange of ordinary type (2 grams of fulminate).
Partie colorée en rouge	Part colored in red in fuzes with red head.
Masselotte	Weight.
Rugueux	Firing pin.
Goupille	Safety pin.
Chapeau	Cap.
Rondelle	Washer.
Amorce fulminante	Fulminate primer.
Grain de poudre	Powder pellet.
Corps de fusée	Body of fuze.
Rondelle de feutre	Felt washer.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ORDNANCE,
Washington, August 18, 1917.
FORM NO. 1807.
Ed. Oct. 20—17—7,000.

PL. 2.

FUSEE-DETONATEUR PERCUTANTE DE 24 31 IAL Mle 1916.



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