July 3, 1951

M. E. BARKER

2,558,726

INCENDIARY ARTICLE

Filed April 9, 1941

2 Sheets-Sheet 1

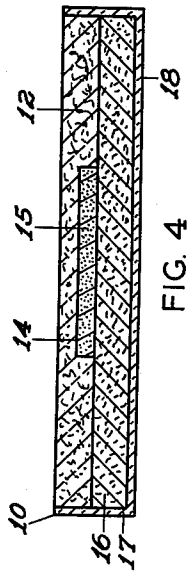

FIG. 4

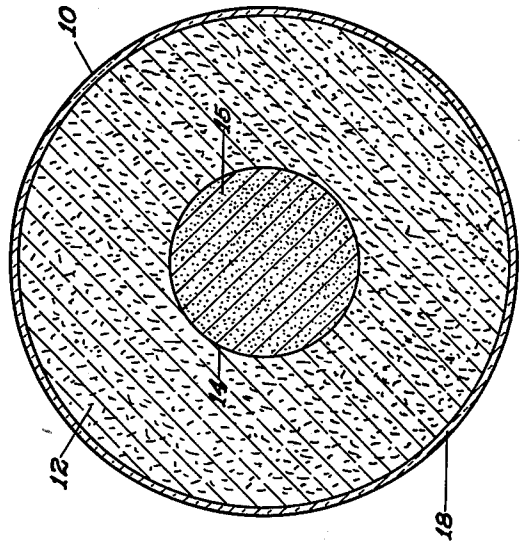

FIG. 5

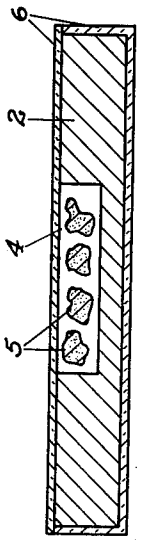

FIG. 1

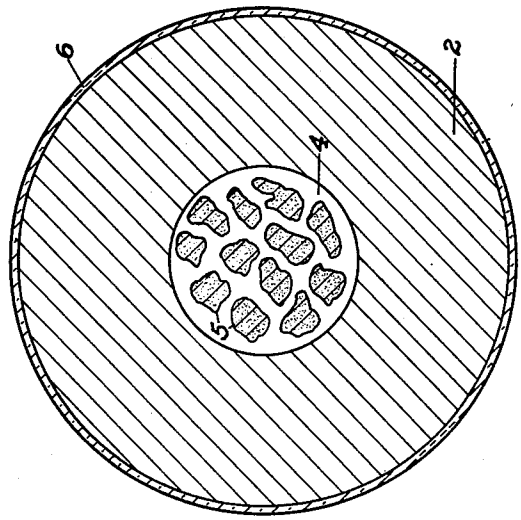

FIG. 2

INVENTOR

MAURICE E. BARKER

By Millard F. Beebe

ATTORNEY

July 3, 1951 M. E. BARKER 2,558,726

INCENDIARY ARTICLE

Filed April 9, 1941 2 Sheets-Sheet 2

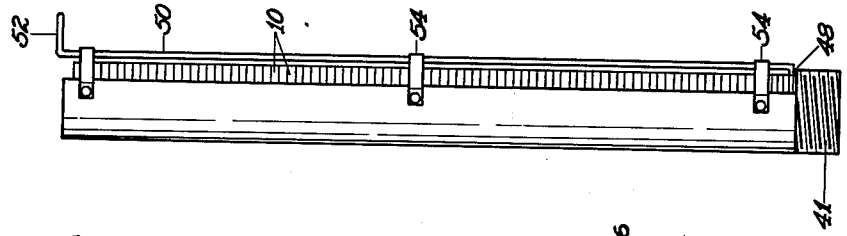

FIG. 7

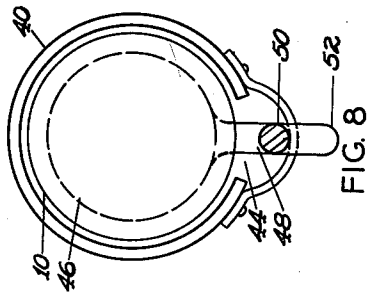

FIG. 8

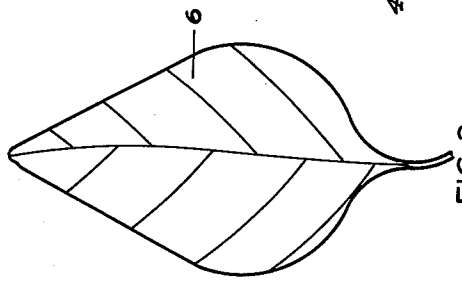

FIG. 3

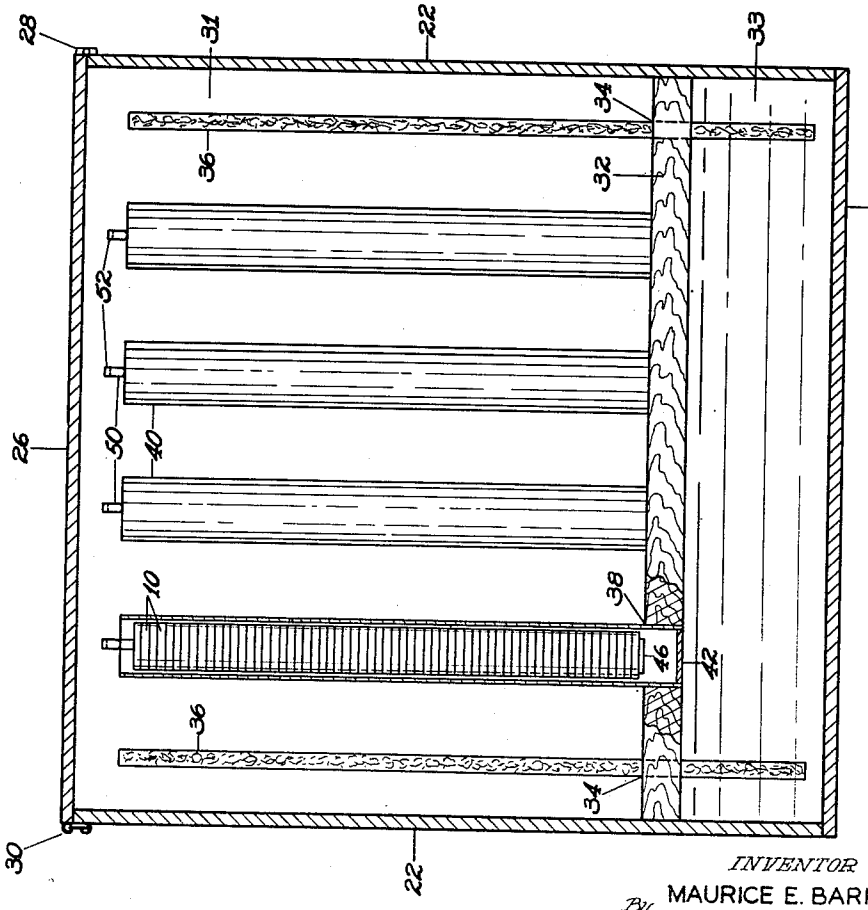

FIG. 6

INVENTOR
MAURICE E. BARKER
By Millard F. Cooke
ATTORNEY

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UNITED STATES PATENT OFFICE

2,558,726

INCENDIARY ARTICLE

Maurice E. Barker, Washington, D. C., assignor to the United States of America as represented by the Secretary of War

Application April 9, 1941, Serial No. 387,553

5 Claims. (Cl. 102—90)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

1

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

This invention relates to an incendiary article.

One of the objects of the invention is to provide an incendiary article.

Another object is to provide an article which will be stable in storage in the absence of air, but which will spontaneously ignite in the presence of air.

Another object is to provide an article which will be stable in storage in water, but which will spontaneously ignite in the presence of air when dry.

Another object is to provide an article provided with a coating which is impervious to air and is stable in a liquid, but which, upon removal from said liquid, will crack, admitting air through the coating and to the article, said article then spontaneously igniting in the presence of air.

Another object is to provide an incendiary article which will conspicuously lie on the ground as a temptation to be picked up by the enemy and which will spontaneously ignite while in his possession.

Another object is to provide an incendiary article which will inconspicuously lie on the ground in contact with combustible material and, when dry, will spontaneously ignite.

A final object is to provide an incendiary article colored and shaped like a fallen leaf and which will inconspicuously lie on the ground, and which will spontaneously ignite and fire any combustible material with which it contacts.

In certain military operations it is desired to have available a plurality of incendiary articles which may be dropped or placed on the ground, and which will subsequently spontaneously ignite to damage enemy property or injury enemy personnel. The incendiary articles may be made so as not to be conspicuous with respect to the ground on which they lie. In this event they will be concealed from enemy passers-by and will ignite and cause fires.

Either of the above modifications may spontaneously ignite at any time to set fire to property irrespective of its effect on enemy personnel.

The invention will be better understood by reference to the accompanying drawings wherein

Figure 1 is a sectional elevation of the incendiary article in the form of a disk,

Figure 2 is a sectional plan view of the incendiary article of Figure 1,

Figure 3 is a plan view of a modification in the form of a leaf,

Figure 4 is a sectional elevation of a further modification in the form of a disk,

Figure 5 is a sectional plan view of the modification of Figure 4,

2

Figure 6 is an elevation of a container for carrying a plurality of the incendiary articles, said container being shown in section,

Figure 7 is a detail elevation of one of the stacks of disks shown in Figure 6,

Figure 8 is a detail plan view thereof.

According to the form of the invention shown in Figures 1 and 3, a disk 2 of rapidly burning material, such as a nitrated cellulose, is provided with a space or hollow portion 4 containing phosphorus 5. Said disk 2 is coated with a coating 6.

For the coating, a material is selected which is impervious to air as long as the incendiary article is kept out of contact with forces or agencies that would cause physical or chemical deterioration of the coating, but which is readily rendered permeable to air by contact with the above named forces or agencies, so that the air may then penetrate through the now permeable coating and through the porous nitrated cellulose to contact and ignite the phosphorus held therein.

An example of such a coating material is one that is stable against the fluid used for storing the incendiary articles coated with said material, and that contains water of gelation which is lost by evaporation when the coating is exposed to air and warmth. Sodium silicate is a specific example of such a coating material, since it readily yields its water of gelation when exposed to air and warmth, forming a porous coating through which air can penetrate to the phosphorus below to cause spontaneous ignition of the phosphorus.

Another specific example is a gel of soluble starch containing clay held in suspension therein. When exposed to air this coating loses its water of gelation, forming large cracks.

Specific examples of other materials which may be applied as a coating to the nitrocellulose and which fall within the scope of the invention are: glue in a mixture of water and alcohol; casein glue in a mixture of water and alcohol; albumen; and a syrup of aluminum oleate or stearate or of magnesium oleate or stearate in benzene.

In preparing the incendiary article the phosphorus is surrounded by a relatively flat, thin shaped mass of nitrocellulose having a substantial area. As brought out above, this mass may be in the form of a disk or of a leaf or of any other suitable object which is relatively thin, flat, and is of substantial area. The nitrocellulose used is porous and is of sufficient degree of nitration to burn readily and rapidly when ignited. However, it is not nitrated to such a high degree of nitration that it will be unduly dangerous to handle. The most suitable degrees of nitration are apparently the first degree or a mixture of the first and second degrees.

As brought out above, the nitrocellulose is

porous. If the nitrocellulose is gelatinized at all, it is not gelatinized to the point of completely destroying the porous structure, that is, a substantial porosity and a substantial air permeability remain after the gelatinization.

Either the lumps of phosphorus themselves may be coated with the coating material according to the invention, or the mass of nitrocellulose may be coated, or both may be thus coated. The coating material may be applied by immersing, by spraying or by any other suitable method either onto the nitrocellulose or onto the phosphorus. Where the coating is applied to the nitrocellulose mass, this coating may be colored and/or printed to resemble well known articles, for example, milk bottle caps or fallen leaves.

Until ready to be used, the incendiary article according to the invention is kept, along with others, under water or other suitable liquid, or in an atmosphere saturated with water vapor, in a convenient container. This container of liquid or vapor and incendiary articles may be carried in an aeroplane or other air vehicle, or in a land vehicle to positions over or adjacent to the locations onto which the incendiary articles are to be dropped or on which they are to be placed. In either event the incendiary articles are removed from the water or other liquid as needed and are either dropped or placed onto or on the target or targets selected.

After the articles have been so dropped, the coating on each of the articles will change from an impervious coating to one which is pervious to air, through the development of pores or cracks or by means of other physical changes. Simultaneous with the above-described change in physical structure of the coating, air seeps through the now permeable coating and contacts the phosphorus, causing the phosphorus to spontaneously ignite. The time required for the articles to dry and ignite may be readily adjusted by variations in the thickness or character of the coating. Generally about 1 to 3 hours is preferred.

The burning phosphorus then ignites the nitrocellulose, which in turn, ignites any combustible material as wood structures, leaves or grass present, at the spot upon which the incendiary article has been dropped. The burning leaves or grass may spread the fire to buildings and other structures, perhaps causing serious damage.

Alternatively, the incendiary articles may be picked up by passers-by before the phosphorus has become ignited. Should the phosphorus become ignited while in contact with a person it may cause severe injury to the person either by igniting the person's clothes which in turn will cause injury to the person, or by directly burning exposed portions of his body. It is further contemplated that the articles may be swept up and stored with other refuse, and will subsequently ignite.

According to the modification of the invention shown in Figures 4 and 5 a disk **10** is divided, preferably transversely of the axis of the disk, into two adjacent sections. One of said sections comprises a disk **12** of nitrocellulose and further comprises a hollowed out portion **14** filled with a disk of white phosphorus **15**. The other of said sections comprises a disk **16** of fibrous nitrocellulose which is pervious to air. Examples of fibrous, pervious nitrocellulose which can be used are nitrated blotting paper, and blotting paper impregnated with nitrocellulose. The disks **12** and **16** are so positioned that the hollowed out portion **14** containing the phosphorus is substantially centrally located with respect to the composite disk **10**, and that the hollowed out portion contacts the disk **16** of fibrous nitrocellulose.

The external face of the fibrous, pervious disk **16** is coated with a coating **17** which is impervious to air as long as said coating is kept in an atmosphere containing a high percentage of water vapor, such as an atmosphere saturated with water vapor, but which will become pervious to air when exposed to moderately dry air. Said coating preferably comprises a thin layer of a mixture of starch, white china clay (kaolin), and gelatin cooked to an even consistency and applied as a thin continuous coat to exclude air while the disk is kept in an atmosphere saturated with water vapor.

The peripheral edge of the composite disk is sealed with a material impervious to air such as marine glue or a solution of nitrocellulose in a solvent, the solvent subsequently evaporating to form a seal of colloidal nitrocellulose. This impervious seal is represented in the drawing by part number **18**.

Thus the composite disk **10** excludes air from the interior thereof as long as said disk is kept in an atmosphere containing a high percentage of water vapor. However, when said disk **10** is exposed to a moderately dry atmosphere, the coating **17** cracks or becomes porous to admit air through the pervious nitrated cellulose portion **16** to the phosphorus in the hollow portion **14**, igniting said phosphorus. The air is admitted to the phosphorus only through the now pervious coating **17**, and the pervious nitrocellulose disk **16**. The colloided nitrocellulose disk **12** and the sealing material **18** remain impervious to air at all times.

A suitable device for carrying a plurality of incendiary disks according to the modification illustrated in Figures 4 and 5 is shown in Figures 6 to 8. This device is not limited to carrying the particular disks of Figures 4 and 5, but may be used for carrying broadly any incendiary articles which do not spontaneously ignite in the presence of an atmosphere saturated with water vapor.

Said device is a container comprising walls **22**, bottom **24**, and a hinged cover **26**, said cover being attached by means of hinge **28** to one of the said walls **22** and removably fastened to an opposite wall by a hook-and-eye device **30**, or by other convenient device. A false bottom **32** separates the container into a main chamber **31** and a plenum chamber **33**. Said false bottom is provided with apertures **34** through which wicks **36** extend from a quantity of water in the plenum chamber to a location near the top of the main chamber, for the purpose of drawing water up from the plenum chamber and passing it off as vapor in the main chamber.

The false bottom **32** is further provided with threaded apertures **38** in which tubes **40** are threadedly engaged with said false bottom. Secured in each tube **40** and near the bottom end thereof is a supporting disk **42** positioned to support a stack of incendiary articles **10**. The tube **40** is not a complete cylinder, but is provided with a slot **44** extending longitudinally of the tube for the entire length thereof or for substantially the entire length thereof.

The mechanism for lifting the incendiary articles **10** from the tube **40** when the articles are to be used is shown in Figures 7 and 8. Said

mechanism comprises a lifting platform **46** positioned within the tube **40** and preferably below the lowest disk **10**, and adapted for travel within the tube **40**. Said lifting platform **46** has a projection **48** extending into the slotted portion **44** of the tube **40**. Integral with said projection is a rod extending lengthwise of the tube **40** and bent at the top to form a handle **52**. Screw threads by which the tube **40** is secured into the false bottom **32** are indicated in Figure 7 by part number **41**.

A preferred method of operating the apparatus will now be described, although the invention is not to be limited thereto. The cover **26** being open, the tubes **40** are initially removed from the false bottom **32**, and water is poured into the plenum chamber **33** through the apertures **38**. In each of the tubes **40** the lifting platform **46** is positioned at substantially the bottom of the tube to rest on the supporting disk **42**. Incendiary articles **10** are then piled above said lifting platform, until the tube **40** is substantially filled with the articles. Each tube so filled is then screwed into the appropriate aperture **38** in the plenum chamber **42**. During storage the wicks **36** keep the main chamber **31** saturated with or substantially saturated with water vapor, and thus prevent drying out and disintegration of the coating on the individual incendiary articles and spontaneous combustion of said incendiary articles.

The dispensing operation will now be described. The cover **26** is opened, and the handle **52** is grasped with the fingers of one hand, and slowly lifted, raising the incendiary articles up and out of the tube **40**. At the same time each incendiary article is grasped as it raises above the upper end of the tube with the other hand and thrown in the desired direction. In case these are being dispensed from an aeroplane onto targets below, the articles are merely thrown clear of the aeroplane when the aeroplane is in the proper position.

The pellets or disks are of such weight and

shape that they will sail and spread broadly over an area, so that many small fires will be started.

It will be understood that variations of this invention will be apparent to those skilled in the art without departing from the spirit of invention nor exceeding the scope of the appended claims.

I claim:

1. In an incendiary device, a self-igniting agent of the type which rapidly increases in temperature to the kindling point when exposed to the air, an enclosing casing initially protecting the agent from the atmosphere but composed at least in part of a material slowly deformable upon continued exposure to the atmosphere to admit air to the agent to initiate ignition.

2. The device of claim 1 in which the material comprises a gel formed of soluble starch and water of gelation and a clay held in suspension in said gel.

3. The device of claim 1 in which the material comprises albumin.

4. The device of claim 1, in which the material comprises glue in a mixture of water and alcohol.

5. The device of claim 1, in which the material comprises benzene and a metal soap.

MAURICE E. BARKER.

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