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NONEXPLOSIVE MASS-SUPPLYING HIGH-TENSIONED GASES FROM COMBUSTION.

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(GRANTED UNDER THE PROVISIONS OF THE ACT OF MARCH 3, 1921, 41 STAT. L., 1313.)

To all whom it may concern:

Be it known that I, WILHELM KOCHMANN, residing at Berlin-Charlottenburg, Germany, have invented certain new and useful Improvements in Nonexplosive Mass-Supplying High-Tensioned Gases from Combustion (for which I have filed applications in Germany April 19, 1917, and January 10, 1921), of which the following is a specification.

This invention relates to the production of gases under a high pressure for mechanical uses by the combustion of gun powder and similar explosives. Such explosives, while capable of being burned in the open air to produce large quantity of gases under atmospheric pressure will when confined in closed vessels, burn with increasing rapidity under the increased pressure of the gases evolved by said combustion, to such an extent as to result in violent explosions. With the use of such explosives for the purpose specified it is therefore necessary to employ containers specially designed and constructed to resist the enormous and sudden pressures produced by these explosions. These containers are naturally difficult and expensive to manufacture and their use as gas producers is always accompanied by the danger of fracture and subsequent damage. In addition to this danger there prevails the additional disadvantage where such producers are used in connection with fire extinguishers and similar apparatus where it is desired to expel a liquid from a vessel in which the explosion occurs that, due to the extreme suddenness of the explosion and to the extreme high pressures of the gases so produced considerable amounts of the gases are absorbed by the liquids before they have time to perform the work for which they were designed.

There have already been produced various explosive-like mixtures which, in contradistinction to the usual black powders, do not explode at ignition but burn slowly. This slow combustion takes place however only under normal pressure. When such substances, e. g. the well known explosive Petroklastite or the like, are ignited in closed vessels, they detonate with great force, as the velocity of the combustion is increased gradually by the gas pressure from the particles which have been burnt first, up to the final detonation.

The inventor has now found out by extensive experiments that all pure gun-powder-like combustible mixtures detonate when being burnt in closed vessels or under higher pressure than atmospheric and that therefore principal alterations in the composition of the known gun-powder-like masses are necessary if these substances ought to lose their explosibility.

It is the object of this invention, therefore, to incorporate with such explosives, neutral substances, preferably non-combustible in nature, but which will under the heat of combustion of the explosives with which they are mixed be decomposed to evolve gases which add to the pressure of the gases produced by the explosion and which will simultaneously dampen the combustible quality of the explosive sufficiently to enable it to be burned in closed vessels.

When a considerable percentage of neutral substances, which means substances which do not participate in the combustion, e. g. kieselguhr, clay or the like, are added to the pure combustible mixtures, no explosion can occur in such a mixture, particularly if the same is in compressed state, the mixture burning quickly and without detonation. It is specially advantageous that these additional substances are decomposed by the heat from combustion and, without however increasing the combustion proper, increase the gas pressure by their products from decomposition. If a carbonate, for instance carbonate of magnesium, is added there will be produced one molecule of magnesium oxide and one molecule of carbonic acid. It is even better to use oxalates. By the addition of iron oxalate and iron oxide two molecules of carbonic acid are produced. Also substances which contain the C N group can be used with advantage. A mixture, which has been profitably used at the experiments, contains for instance 13.5% of hard pitch, 65% of sodium nitrate, 5% of potassium ferrocyanide. The remainder consisted of potassium oxalate or iron oxalate and a little kieselguhr. It is evident that on this basis numerous different non-explosive masses, can be composed.

When mixtures of this kind are burnt in closed spaces or under considerable pressure a certain acceleration of the combustion takes place at increasing pressure, but there has never been observed an explosion-like phenomenon. The explosive capacity has completely disappeared, this having been confirmed by controlling experiments in the following manner: a combustible mixture composed of sodium nitrate, sulphur, coal and pitch in the usual proportions detonates in closed vessels and at ignition by a strong detonating primer. The same mixture with addition of iron oxalate produces a gas pressure increased correspondingly by the addition of the oxalate but it does not detonate in closed vessels and it cannot even be made to explode when initiated by a strong detonating primer, but is dispersed by the detonating primer, the several components burning slowly and for a long time. By these controlling experiments it has been shown that the exploding capability has completely disappeared not only at the burning in closed vessels but also with a strong initial ignition.

Additions of the neutral substances described present the additional advantage that by the decomposition of the additions a considerable part of the heat of combustion is absorbed.

The acceleration of the speed of combustion of the non-explosive combustible mixtures in closed vessels or when being burnt under pressure can be controlled by altering the composition of the mixture and by properly shaping the non-explosive masses. The combustible masses can be made for certain purposes in conical shape, the combustion progressing from the largest to the smallest cross section whereby the rate of increase of pressure becomes gradually smaller. A column of such combustible mixture could be subdivided into parts so that the burning of a new quantity begins only when the gases from combustion of the recently burnt quantity have already expanded. This can be obtained easily by composing such a column of several cylindrically compressed bodies and by separating the several compressed bodies by plates of non-combustible material, which have near the edge an aperture through which the fire can be transmitted. When several such plates are inserted between two successive compressed bodies, said plates being displaced the one with regard to the other, one body must burn down completely before the next following body can be ignited through the aperture and the ignition must have continued over the entire cross section and length of the second body before the third body can be ignited. When the material thus arranged is made to burn for instance in a vessel which is filled with a liquid in order to force the liquid out by the pressure of the gases, the speed of the gas production can be brought more or less in accord with the enlargement of the space which is at disposal for the gases produced by the outflow of the liquid.

A further compensation of the relatively small acceleration of the speed of combustion resulting from the increase of pressure can be obtained by adding greater quantities of neutral substances to the part of the combustible mixture which is to be burnt later than to the part which has to be burnt first.

These non-explosive powder masses supplying neutral and highly tensioned gases from combustion permit of the most various applications. The gases which are thus produced could be utilized for example chemically in enveloping inflammable liquids that have become ignited in order to separate the liquids from the oxygen of the air to extinguish the flame. The mechanical power of the gases produced could further be utilized as the usual compressed gases are generally utilized, as for instance to eject liquids from vessels (fire extinguishers, liquid sprayers for agricultural purposes or the like), or to operate pneumatic tools, brakes, presses and the like, to expel the water from sunk or leaky ships, to carry out very slow shooting and blasting and breaking up of solid material in such cases where the explosive effect of the substances used hitherto would be too violent. These are only a few examples of application but numerous other applications are possible.

The ignition of the masses can be effected chemically, mechanically or electrically.

I claim:—

1. A non-explosive combustible mass for producing gases under pressure by combustion in a closed space consisting of a mixture of an ordinary explosive and of neutral gas producing substances which mainly or in general do not take part in the combustion.

2. A non-explosive combustible mass for producing gases under pressure by combustion in a closed space consisting of a mixture of an ordinary combustible and of noncombustible substances which mainly or in general do not take part in the combustion, said non-combustible substances being decomposed by the heat from combustion to produce gases which increase the pressure and dampen the combustible quality of the combustible.

3. A non-explosive combustible gas producing mass such as recited in claim 2, said mass being shaped in a manner to control the rate of generation of the gases generated by the combustion thereof.

4. A non-explosive combustible mass for producing gases under pressure by combus-

tion in a closed space, consisting of a mixture of an ordinary explosive and of neutral combustible substances which mainly or in general do not take part in the combustion, said mass being sub-divided by non-combustible partitions whereby the burning of the total mass may be retarded and the gases formed by the combustion of said mass may be produced in increments for dampening the combustible quality of the combustible.

5. A non-explosive combustible mass for producing gases under pressure by combustion in a closed space consisting of a mixture of an ordinary explosive and of neutral non-combustible substances which mainly or in general do not take part in the combustion, said non-combustible substances being decomposed by the heat from combustion and to produce gases which increase the pressure, said neutral substances being distributed through the mass in various proportions whereby the rate of gas generation may be controlled.

6. A non-explosive combustible mass consisting of 13½ per cent of pitch, 65 per cent of sodium nitrate, 5 per cent of potassium ferrocyanide and the remainder of potassium oxalate and kieselguhr.

In testimony whereof I have signed this specification in the presence of two witnesses.

WILHELM KOCHMANN.

Witnesses:
DR. NO. STRENICH,
KATHE LEECK.