UNITED STATES PATENT OFFICE.

CLIFFORD A. WOODBURY, OF CHESTER, PENNSYLVANIA, ASSIGNOR TO E. I. DU PONT DE NEMOURS POWDER COMPANY, OF WILMINGTON, DELAWARE, A CORPORATION OF NEW JERSEY.

PROCESS OF VARYING THE VELOCITY OF DETONATION OF EXPLOSIVES.

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To all whom it may concern:

Be it known that I, CLIFFORD A. WOODBURY, of Chester, in the county of Delaware and in the State of Pennsylvania, have invented a certain new and useful Improvement in Processes of Varying the Velocity of Detonation of Explosives, and do hereby declare that the following is a full, clear, and exact description thereof.

The object of my invention has been to provide a process of varying the velocity of detonation of explosives by which an explosive of a given type can be given a velocity of detonation varied to suit special types of work, and to such ends my invention consists in the process of varying the velocity of detonation hereinafter specified.

While my invention is capable of use with many types of explosives, I have chosen to illustrate it in connection with an explosive which is especially adapted for coal mining, but such illustration is to be regarded as typical only of many possible illustrations of the practice of my invention and my invention is not to be confined thereto. The said explosive has the following formula: nitrate of ammonia, 80%; nitroglycerin, 10%; absorbent (such as wood pulp) 10%.

I have found that by using nitrate of ammonia which is in the form ordinarily produced, the explosive has a relatively high velocity of detonation and breaks the coal into small pieces. Where it is desired to produce what is known as "lump coal," the said velocity of detonation would be altogether too high, for a high velocity of detonation breaks the coal up small. I have discovered that by using nitrate of ammonia in the form of relatively coarse grains, or the bulk of which is in relatively coarse grains, I can reduce the velocity of detonation to a point where the coal is not shattered in the objectionable manner. In other words, I have discovered that the velocity of detonation can be varied by increasing the size of the grains of nitrate of ammonia to decrease the velocity of detonation.

Most high explosives used in coal mines have a velocity of detonation of about 3000 meters per second or more, and tend to bring down the coal in very small pieces. Much better results can be obtained in the production of large lumps of coal if an explosive is used whose velocity of detonation is 2600 meters per second or less. Until recently no practical way has been known of varying the velocity of detonation of explosives without changing the composition, such, for example, as by the addition of nitrocotton, thus making a gelatin powder, which is entirely different from other dynamites in other respects besides velocity of detonation, or by changing the percentage of nitroglycerin, thus changing the strength of the explosive. I have discovered that in an explosive of the type illustrated above I can vary the velocity of detonation at will within certain limits by controlling the fineness of grain of the ammonium nitrate used. If, for example, I use in an explosive of this kind ammonium nitrate of such fineness that 40% of it passes a 100-mesh sieve, and not more than 5% is held on a 40-mesh, I obtain an explosive which has a velocity of detonation of about 3600 meters per second. It is possible on the other hand, by using a coarser grained ammonium nitrate, to obtain an explosive of the composition noted above whose velocity of detonation is below 3600 meters per second. This difference is so great that entirely different effects are produced.

While I have described my invention above in detail, I wish it to be understood that many changes may be made in the details thereof without departing from the spirit of my invention.

By the term "relatively large", as applied to the size of the grains or particles in the claims, is meant grains of nitrate of ammonia substantially as large or larger than grains of which not more than approximately seventeen per cent. by weight will pass through a sixty mesh sieve. By the term "relatively low velocity of detonation" appearing in the claims, is meant a velocity of detonation substantially lower than twenty-seven hundred meters per second.

I claim:

1. The process of determining the velocity of detonation of dynamite, which consists in utilizing grains of ammonium nitrate of a relatively large size to obtain a relatively low velocity of detonation.

2. The process of making two explosives of different velocities of detonation, which consists in forming that one of relatively high velocity by the use of smaller grains of ammonium nitrate than the other one.

3. The process of reducing the velocity of detonation of an explosive comprising ammonium nitrate, which consists in increasing the size of the grains of ammonium nitrate.

4. The process of producing an ammonium nitrate explosive of relatively low velocity of detonation, which consists in introducing into such explosive ammonium nitrate in the form of relatively large grains.

5. The process which comprises producing explosives having varying velocities of detonation by adding thereto ammonium nitrate consisting of grains varying in size according to the rate of detonation desired.

In testimony that I claim the foregoing I have hereunto set my hand.

CLIFFORD A. WOODBURY.

Witnesses:
C. R. MUDGE,
FREDERICK LORENGALLUP.