UNITED STATES PATENT OFFICE.

CHARLES HERBERT COY, OF BOSTON, MASSACHUSETTS.

PROCESS OF MAKING EXPLOSIVE POWDER.

SPECIFICATION forming part of Letters Patent No. 681,908, dated September 3, 1901.

Application filed October 10, 1900. Serial No. 32,561. (No specimens.)

To all whom it may concern:

Be it known that I, CHARLES HERBERT COY, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Processes of Making Explosive Powder, of which the following is a specification.

This invention has for its object the production of a powder which will not explode unless confined and held under pressure, but when properly confined in a hole drilled in rock, coal, or slate or back of a projectile in a rifled barrel will explode with great force.

The invention also has for its object to produce a semi smokeless, flameless, and odorless powder, these qualities being eminently desirable in powder used in mines of mineral and coal and in stone and slate quarries, because there is no flame to ignite pit-gases and no noxious fumes and gases to prevent workmen from entering mines or tunnels immediately after a blast, the powder being comparatively safe in manufacturing, handling, transportation, and storage, because it is non-explosive when unconfined.

My powder is a combination of a highly-gaseous bituminous coal low in foreign and earthy substances, nitrate of sodium, and sulfur, treated during the process of manufacture with a volatile hydrocarbon and with boiling water, as hereinafter described.

The specific materials used in the process and the proportions that make the most perfect powder known to me are as follows: seventy and one-half per cent. nitrate of sodium, fifteen and one-half per cent. highly-gaseous bituminous coal containing from thirty to forty per cent. of volatile matter, twelve and three-fourths per cent. sulfur, one and three-fourths per cent. hydrocarbon, preferably gasolene, and three gallons, more or less, of boiling water.

I have demonstrated by my various experiments and tests that a commercial volatile hydrocarbon is a useful incorporating agent in admixing nitrate of sodium, gaseous bituminous coal, and sulfur and causes the combination to become more easily a homogeneous mixture. Upon subsequent treatment in the manner specified below the bulk of the hydrocarbon becomes evaporated, leaving a residue, which acts as a binder, giving great cohesive strength to the cakes when subjected to hydraulic pressure of four thousand pounds per square inch, this being essential in finishing and graining the powder to be graded and in keeping it from deterioration and caking.

My process hereinafter described produces a powder that has a finished grain of cohesive strength and that can be graded to various sizes, giving all the various grades required to meet the commercial demands for a powder that will not cake or deteriorate in time.

In describing my process, and assuming that a batch of three hundred pounds is to be made, I take two hundred and eleven and one-half pounds nitrate of sodium and forty-six and one-half pounds bituminous coal, each previously reduced to an impalpable powder in a suitable pulverizing apparatus and then transferred to a mixer, where it is thoroughly mixed. To the mixture I add one-half gallon of volatile hydrocarbon, preferably gasolene. When the hydrocarbon is fully incorporated into the mixture, the whole is transferred to a suitable steam-jacketed mill or equivalent apparatus, heated as hot as possible with live steam, the mixture being spread evenly over the heated bottom of the mill. While the mill is in operation I add from two to three gallons of boiling water, which causes an intimate mixture or union between the nitrate and coal-dust. Under some circumstances an additional quantity of boiling water may be required. After the mill has run twenty minutes I add thirty-eight and one-fourth pounds of sulfur previously pulverized and continue running the mill for forty minutes longer until the mixture assumes a dark-brown color and is as dry as it is possible to make it without the wheel cutting through onto the bed. A series of carefully-conducted experiments and tests have proved beyond a question of doubt that the mixing apparatus should only be used for mixing the nitrate of sodium and the carbon. If sulfur is added before the soda and carbon are incorporated together, the product will be much inferior. This process insures a thorough mechanical mixture of all the ingredients, the entire mass being homogeneous and ready for pressing

into cakes. The mass or compound is then transferred to a hydraulic press, where it is subjected to a pressure not to exceed four thousand pounds per square inch, and thus formed into cakes. These cakes are taken to a corning-mill and there grained, the dust being removed from the grains by a suitable screen attachment. The grained powder is then dried in a drying-room, the air of which is maintained at a temperature of 175°, and allowed to remain there for ten hours, and is then glazed in any suitable revolving glazing-barrel. After the barrel has run for four hours there is added a small quantity of the best graphite, and the barrel is run for six hours longer. From the glazing-barrel the grained powder goes to a sizing-mill, which assorts the various grades from "fuse" or "dust powder" to "O. F.," the coarsest grade, thus completing the operation of making a perfectly glazed, grained, and graded powder that will maintain its form and will not cake or deteriorate in time, as various kinds of black powder do. The volatile hydrocarbon has a softening effect on the pulverized bituminous coal, enabling said ingredients to more readily unite before the addition of boiling water and sulfur. This softening effect is apparent throughout the subsequent steps of the process and assists particularly in the pressing operation, giving the particles greater adhesiveness to each other under pressure, so that the hydrocarbon has indirectly a binding effect.

The powder made as above described is free from liability to deliquescence and is therefore adapted to be stored for long periods of time without deterioration on account of moisture. This quality of the powder is due in part to the effect of the volatile hydrocarbon.

I claim—

1. That improvement in the process of making explosive powder, which consists in first mixing nitrate of sodium and carbon, then adding a volatile hydrocarbon thereto, and then heating the mixture.

2. That improvement in the process of making explosive powder, which consists in first mixing nitrate of sodium and carbon, then adding a volatile hydrocarbon thereto, then heating the mixture and triturating it while it is heated.

3. That improvement in the process of making explosive powder, which consists in first mixing nitrate of sodium, then adding a volatile hydrocarbon thereto, and then simultaneously heating and triturating the mixture, and at the same time adding boiling water thereto.

4. That improvement in the process of making explosive powder, which consists in first mixing nitrate of sodium and carbon, then adding a volatile hydrocarbon thereto, then adding boiling water to the mixture, then simultaneously heating and triturating, and then adding sulfur and additionally triturating.

In testimony whereof I have affixed my signature in presence of two witnesses.

CHARLES HERBERT COY.

Witnesses:
C. F. BROWN,
A. D. HARRISON.