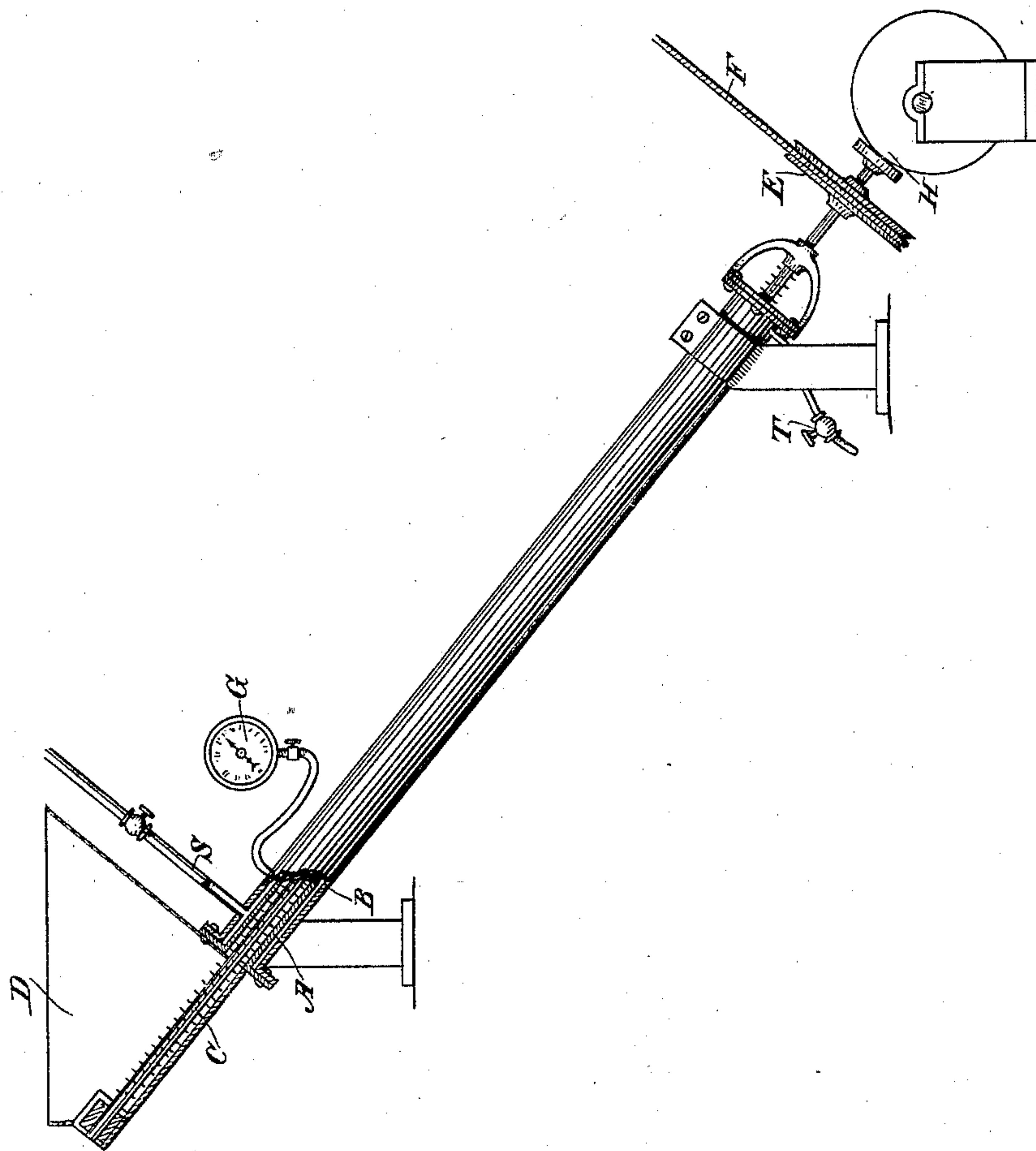


(No Model.)

W. R. QUINAN.  
MIXER FOR EXPLOSIVES.

No. 427,707.

Patented May 13, 1890.



Witnesses,  
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# UNITED STATES PATENT OFFICE.

WILLIAM R. QUINAN, OF PINOLE, CALIFORNIA.

## MIXER FOR EXPLOSIVES.

SPECIFICATION forming part of Letters Patent No. 427,707, dated May 13, 1890.

Application filed December 20, 1889. Serial No. 334,426. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM R. QUINAN, a citizen of the United States, residing at Pinole, Contra Costa county, State of California, have invented an Improvement in Apparatus for Mixing Gunpowder and Dynamite; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to the class of mechanisms used in the art of making gunpowder and dynamite; and it consists of a steam-jacketed tube through which the composition is passed and a stirrer, conveyer, or mixer operating within the tube, as will be hereinafter fully described, and the novelty specifically pointed out in the claims.

The object of my invention is to produce cheaply and continuously a composition which is to be used directly as an explosive or as a dope to which a percentage of nitro-glycerine or other explosive is to be added to give it the necessary explosiveness.

My invention relates only to compositions which contain one or more ingredients that can be melted or softened by a moderate heat, which ingredient serves to cement or aggregate the particles of the composition into grains. My apparatus is designed to melt or soften this ingredient and mix it with the others, so as to form by continuous process a plastic mass which can be readily grained. In ordinary gunpowder or black blasting-powder the sulphur is such an ingredient. My apparatus can also be used in preparing the dope for certain classes of dynamites, especially low dynamites or those which contain a small percentage of nitro-glycerine. In these sulphur may be used as an ingredient; also, resin, paraffine, asphaltum, and various other substances which serve the purpose desired.

In preparing fire-explosives—such as gunpowder—the ingredients should be pulverized as finely as possible and mixed in the proper proportions before being passed through my apparatus. The finer the materials the more intimate the incorporation effected by the apparatus and the better the powder.

In making the dope for dynamites or other detonating explosives the ingredients need

not be ground fine, but should be mixed in proper proportions.

My apparatus may vary considerably in detail.

The accompanying drawing, which is a part section and part elevation, represents a typical example, though I do not confine myself to the dimensions given nor the exact arrangement of the minor parts. It consists of a metal tube A—say three inches in diameter and about ten feet long. This may be a piece of thin boiler-tubing. This is jacketed with a larger tube B—say four and one-half inches in diameter—of about the same length, with steam-tight joints at the ends. The tube B is covered with a good non-conducting coating such as is used on steam-boilers. Inside of the inner tube A is a “stirrer,” “conveyer,” or “mixer” C, consisting of a shaft or piece of pipe studded for the greater part of its length with pins about one and one-fourth inch apart, set spirally around the shaft. The pins extend beyond the inner tube at both ends and are of such length that their ends just clear the inside surface of the inner tube A. A hopper D is placed at the upper end of the tube. The apparatus is set at an incline of about forty degrees with the horizontal. The stirrer is revolved by a pulley E and wire rope F about one hundred and twenty revolutions a minute, and at the same time, by any usual device—such as is shown by the cam or eccentric at H—is given a short reciprocal motion in the tube, this to enable the pins to reach all parts of the tube and prevent the composition from clogging. The space between the inner and outer tubes is connected with a steam-boiler. Steam at forty or fifty pounds pressure is allowed to enter through the connection S, and the condensed water is drawn off at T.

In operating the apparatus the composition is placed in the hopper D. The revolution of the stirrer, assisted by gravity, causes it to move through the tube, which is heated by the steam. The steam is regulated by the gage G, which should be kept, say, at forty pounds. In this way a temperature of about 248° Fahrenheit can be maintained in the tube and the composition heated to about this point. This causes the sulphur to melt and permeate the



mass, a thorough mixing or incorporation being effected with the stirrer. The plastic and pulverulent composition flows out of the tube at the lower end and may be received upon  
 5 sieves and granulated. If during this operation it is cooled slightly, which may be effected by allowing it to roll down an inclined plate below the sieves, the individual grains will not stick to each other, but will remain sepa-  
 10 rate. The foregoing applies specially to sulphur compositions. The steam-pressure and consequent temperature can be suitably modified for the fusion of other substances.

The capacity of the apparatus will depend  
 15 upon various circumstances. The larger the tube the greater the amount of composition which can be heated at one time. The steeper the tube is set or the more rapidly the stirrer is revolved the faster the composition will pass  
 20 through; but if it comes too fast the sulphur will not be properly melted. This case may be met by raising the steam-pressure or diminishing the feed. It is advisable, however, not to use steam above fifty or sixty pounds,  
 25 both on account of the danger of too high a temperature and because the sulphur, if overheated, becomes stiff and viscous. It will be found that the composition flows best at a temperature of about 248°. It is better to get  
 30 the requisite capacity by mounting a number of tubes.

The advantages are simplicity and cheapness of plant and continuity of process; also, little or no skill is required to work the appa-  
 35 ratus. The steam-gage is a simple and reliable guide to the workman.

In regard to gunpowder made with this apparatus, if it has the usual composition, it must be considered as a crude cheap product.  
 40 The grains are light and porous. For general purposes it cannot compete with that made by more expensive processes; but there are compositions in which stronger oxidizing agents are used than in gunpowder. The apparatus serves a good purpose in preparing  
 45 these. In preparing the dope for low dynamites it has many advantages, giving a fairly-grained powder and one which resists the attack of moisture better than usual. The  
 50 expense for steam in this method is quite small. If the materials are dry, as they should be when put in the tube, the amount of steam

consumed is that required to heat the composition to 248° Fahrenheit and melt the sulphur. The specific heat of powder ingredients is small, and so also is the latent heat  
 55 of sulphur. Taking an ordinary composition I have calculated that one pound weight of steam at forty pounds pressure will raise the temperature of the ingredients from 60° to 248°  
 60 Fahrenheit and melt the sulphur in twenty pounds of composition. With good coverings for the steam-pipes the loss of heat should not exceed ten per cent. If the materials are  
 65 warm as well as dry, which can be readily managed by using the niter fresh from the drying process, the steam consumed by keeping the gage at forty pounds will be still further reduced. As a pound of steam at this  
 70 pressure can be ordinarily generated with about one-sixth of a pound of coal, the fuel expense is very moderate.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A powder-mixing apparatus consisting of a steam-jacketed tube through which the composition is passed, a stirrer, conveyer, or mixer within the tube, and means for rotating and longitudinally reciprocating said stir-  
 80 rer, conveyer, or mixer, substantially as herein described.

2. A powder-mixing apparatus consisting of a steam-jacketed tube through which the composition is passed, a stirrer, conveyer, or  
 85 mixer within the tube, means for rotating said stirrer, conveyer, or mixer, and a cam or eccentric for imparting a reciprocal movement to the same, substantially as described.

3. A powder-mixing apparatus consisting  
 90 of a steam-jacketed tube through which the composition is passed, a hopper at the inlet end of said tube for supplying the material thereto, and a stirrer, conveyer, or mixer operating within the tube, said stirrer having  
 95 an axial and short longitudinal reciprocating movement, substantially as herein described.

In witness whereof I have hereunto set my hand.

WILLIAM R. QUINAN.

Witnesses:

J. P. BARRETT,  
 A. J. WILLSON.