

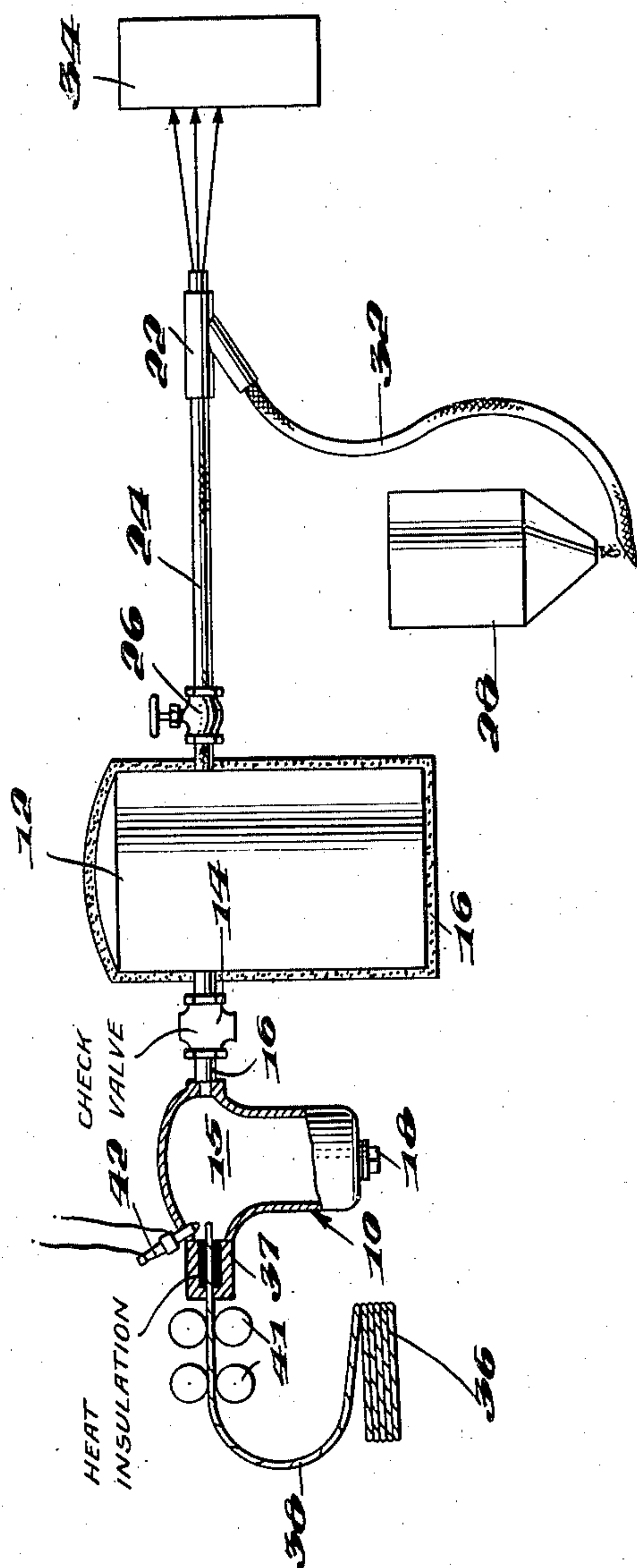
May 7, 1946.

W. L. KEEFER

2,399,680

ABRASIVE BLASTING

Filed April 12, 1945



Inventor
WALTER L. KEEFER,

By *William D. Hall*
Attorney

UNITED STATES PATENT OFFICE

2,399,680

ABRASIVE BLASTING

Walter L. Keefer, Hagerstown, Md., assignor to
Pangborn Corporation, Hagerstown, Md., a
corporation of Maryland

Application April 12, 1945, Serial No. 587,874

4 Claims. (Cl. 51—282)

The present invention relates to a method of propelling abrasive particles at blasting velocities wherein the granular abrasive material is accelerated by expanding gases resulting from the deflagration of solid combustible materials.

It is an object of the invention to provide a method for accelerating abrasive to a velocity for blasting articles, abrading various materials or peening articles, by a gaseous medium placed under pressure during the deflagration of suitable combustible materials and permitting the gaseous medium to expand as a forceful jet which is utilized to carry the abrasive particles forwardly into impingement with the article or surface to be treated by bombardment of the abrasive particles.

These objects and other characteristic features of the invention will be more clearly understood and appreciated as the present disclosure proceeds and upon consideration of the accompanying drawing wherein an exemplary type of apparatus is diagrammatically illustrated for carrying out the invention.

This invention relates to the propulsion of granular abrasive material by means of an expanding gaseous medium so as to carry the abrasive particles forwardly as a blast stream for cleaning articles, cutting or abrading the surface or peening articles to increase the fatigue life thereof. In carrying out the invention a suitable combustible material is deflagrated within a confined space or chamber whereby gas pressure generated during such burning provides a gaseous medium under increased pressure which then moves into a storage tank. A supply of gaseous medium under pressure is thus obtained which is utilized for propelling the abrasive. The gaseous medium under pressure is permitted to move from the storage tank and expand through a nozzle or gun to provide a forceful jet of the expanding gaseous medium in which the abrasive particles are entrained and moved at blasting velocities into engagement with the article or surfaces to be blast treated.

One type of apparatus for carrying out the invention is shown in the drawing. A housing 10 is provided within which combustible material as hereinafter described is to be deflagrated for the generation of a gaseous pressure therein. The housing 10 provides a chamber 15 therein which is completely closed so that upon deflagration of the combustible material a gaseous pressure is built up within the housing. The chamber 15 is connected to a storage tank 12 by means of a conduit 16. A check valve 14 is arranged in the conduit 16 which permits the gaseous pressure

generated in the chamber 15 to pass into the tank 12 but prevents the return of the gaseous medium into the housing 10. The storage tank 12 may be encased with suitable insulating material 16 to prevent the cooling of the gases stored therein and a reduction of pressure within the tank 12. The housing 10 may be provided with a plug 18 threaded in an opening in the lower portion thereof whereby any residue may be removed from this housing.

The gaseous medium stored in the tank 12 may be supplied to a blast gun 22 of a conventional type through a hose 24 when the valve 26 is open. The blast gun 22 is of the type which is adapted to provide a partial vacuum therein as the gaseous medium passes therethrough. The abrasive particles may be stored in a hopper 28 and drawn into the gun 22 through a hose 32 whereby the abrasive particles are entrained in the forceful jet escaping from the gun 22. The abrasive particles entrained in the expanding gaseous medium may therefore be moved into engagement with the surface or article to be treated and which is diagrammatically represented at 34.

The combustible material for deflagration within the housing 10 is in the form of a rope or cord 38. A coil of the rope or cord is shown at 36. This cord may have an outer sheathing or jacket formed of helically wound ribbon with the edges of the ribbon overlapping and forming a continuous tube within which the combustible material is arranged. The rope or cord 38 is fed into the housing 10 by means of a plurality of rollers 41 which may be driven at a speed to feed the rope or cord into the housing 10 at a rate substantially equal to the speed at which the combustible material is deflagrated. The housing 10 is accordingly provided with an apertured extension 37 and a heat insulating bushing through which the rope like combustible material is fed into the combustion chamber 15. The rope or cord may be ignited by any suitable means such as an electrically heated device 42 which carries a hot wire element adjacent the point where the rope like combustible material enters the combustion chamber. It will be appreciated that after the combustible material has been ignited the igniting device may be rendered inoperative until it is desired to re-establish combustion within the housing 10. As the supply of the cord or rope 38 is being exhausted the end of another rope may be introduced between the rollers 41 so as to provide a continuous generation of the gaseous pressure within the combustion chamber 15.

The cord or rope may contain a mixture of potassium nitrate, sulphur and charcoal within the helically wound ribbon which provides a sheath for the combustible material. Such a mixture is known as black gun powder and upon deflagration thereof within the combustion chamber 15 provides for the generation of a gaseous medium under relatively high pressure. The combustible material may also comprise a nitrocellulose base propellant material. Thus the nitrocellulose material may be colloided with a solvent such as alcohol-ether, acetone or ethyl acetate. The colloided material preferably retains part of the solvent so as to reduce the burning rate. Accordingly, a non-volatile solvent may be employed such as ethyl ether or ethylene glycol. Other solvents that may be employed include methyl ether of ethylene glycol, glycol diacetate, monoethyl ether of diethylene glycol and all of these solvents may be regarded as low molecular ethers and esters of ethylene glycol.

The present invention provides a method of abrasive blasting wherein the combustible material may be continuously burned to provide a supply of gas under pressure within the tank 12. The deflagration of the combustible rope or cord 38 generates a gaseous pressure within the chamber 15 which escapes through the check valve 14 into the tank 12. The pressure increase in the chamber 15 is to some extent obtained from the increase in temperature attendant the burning of the combustible material and the gaseous medium in the tank 12 is maintained at an elevated temperature by the insulating jacket 12. When it is desired to initiate a blasting operation the valve 26 is opened whereby the gaseous medium under pressure moves from the tank 12 through the hose 24 and the gun 22. The rush of the propelling medium through the gun or nozzle creates a vacuum therein for drawing abrasive through the hose 32 into the gun. The abrasive is entrained in the propelling medium and is moved forwardly by the forceful jet and into engagement with the article or surface to be blasted.

While the invention has been described by reference to particular apparatus and to specific

types of materials for the generation of the gaseous pressure it is apparent that changes may be made in the apparatus and the character of the explosive materials. Such changes may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

I claim:

1. A method of propelling abrasive particles at blasting velocities which comprises, deflagrating a combustible material in a confined space to provide a gaseous medium under pressure, storing the gaseous medium under pressure, permitting the gaseous medium to expand as a forceful jet, and entraining abrasive particles in the jet whereby the abrasive is moved forwardly as a blast stream.

2. A method of propelling abrasive particles as a blast stream which comprises, deflagrating an explosive material in a confined space to generate a gaseous pressure for escape into a storage chamber, continuing the deflagration of the explosive material, permitting the gas to expand from the storage chamber as a forceful jet, and entraining abrasive particles in the forceful jet to provide a high velocity blast stream.

3. A method of abrasive blasting which comprises, deflagrating a combustible material in a confined chamber to increase the gaseous pressure therein, moving combustible material into the chamber at a speed substantially equal to the burning rate to provide recurring pressure increases in said chamber, permitting gaseous medium to expand as a forceful jet in the presence of abrasive particles to provide an abrasive blast stream.

4. A method of abrasive blasting which comprises, moving a cord shaped combustible material into a closed housing, igniting the combustible material within the housing to increase the pressure therein and moving the combustible material into the housing at a speed corresponding substantially to the burning rate of the material, and employing the gases expanding from said housing to entrain and move abrasive particles as a forceful abrasive blast stream.

WALTER L. KEEFER.