My invention relates generally to the art of riveting and more particularly to a novel means for detonating explosive rivets. As will be seen from the following specification, I provide a very simple and highly portable apparatus for accomplishing what has heretofore been a very difficult problem.

The use of explosive rivets, i.e., rivets having a hollow shank in which is sealed a small quantity of gun powder or other explosive material, has been materially retarded due to the lack of suitable means for easily and quickly detonating the rivets. Hot irons similar to soldering irons have been tried with rather poor results due to the fact that they are difficult to manipulate and to insulate, thus creating an occupational hazard which is highly undesirable. It has also been proposed to detonate explosive rivets by the use of radio frequency waves, but to date apparatus for accomplishing this method has been too cumbersome and expensive as to make it thoroughly impractical in ordinary production.

The major object of my invention is to provide an apparatus for detonating rivets which is easy to operate, will not necessitate the learning of a new technique by the operator, and which will completely obviate the occupational hazards and general disadvantages which follow the use of known detonating means.

It is also an object of my invention to provide a rivet detonator, which I will hereinafter refer to as a rivet gun, which is relatively small and light and consequently portable and easily maneuverable, which characteristics are essential for a successful device of this type.

In general, I accomplish the detonation of explosive rivets by directing a beam or cone of heat rays upon the head of the rivet in such manner that sufficient heat is concentrated on rivet head to quickly detonate the explosive material inside of the rivet. Suitable cooling means may also be provided to dissipate excess heat in the device between operations so that there will be no disastrous results from accidentally contacting the person of the operator or an inflammable substance with the gun immediately after its use.

The heat rays are produced electrically so that the gun can be used wherever there is a source of electric power.

The various objects and advantages above stated as well as other objects and advantages of my invention will become apparent from the following description thereof and from the accompanying drawing, in which:

Fig. 1 is a vertical longitudinal section of my preferred form of rivet gun, shown in position to engage a rivet and explode the same.

Fig. 2 is a vertical cross-section, taken on the line 2—2 of Fig. 1, and

Fig. 3 is a horizontal cross-section, taken on the line 3—3 of Fig. 1, and showing the cooling apparatus.

Referring now to the drawing and particularly to Fig. 1 thereof, the numeral 10 indicates generally the main housing or barrel of my rivet gun and the numeral 11 indicates generally the handle thereof, which is disposed upon the underside of the housing 10 and is preferably fashioned with a pistol grip shape. The housing 10 is formed of a rear portion generally hemispherical or paraboloid in shape and indicated by the numeral 12, and a conical forward portion indicated by the numeral 13, the two together forming a chamber provided with a small aperture or orifice 14 at the apex of the cone 13, which I will hereinafter refer to as the throat 14. The apex portion of the cone 13 forming the throat 14, I will refer to as the tip 15, and it is preferably provided with a suitable recess 16 adapted to receive the head of a rivet and prevent lateral movement of the gun while the rivet is being detonated. It will be apparent that when the shank 16 of the rivet is inserted in its appropriate hole and the gun tip 16 is seated on the rivet head 17, that movement of the rivet is prevented, and it may be held firmly in position for detonating.

The two portions 12 and 13 of the gun housing 10 are preferably detachable from one another, one suitable method of accomplishing this being to provide the screw-thread 18 shown in Fig. 1 of the drawing. The rear portion 12 of the housing is provided with an axial aperture and boss 20, in which is fastened and electrical plug 21 adapted to receive an electric bulb 22 having a high intensity filament 23 therein. A suitable insulated electrical conductor 24 connects the plug 21 to a master switch 25 disposed in the upper portion of the handle 11 and to be described more in detail hereinafter.

The inside of the rear portion 12 of the housing is provided with an elliptical reflector 26 of suitable material, preferably gold plated, which is highly reflective of infra red rays and is formed so that it will focus or concentrate most of the rays falling thereon from the filament 23 on the recess 18 just beyond the throat 14, where they will fall upon the rivet head 17 when it is seated in the recess 18. As mentioned, the filament 23 is one which develops a relatively large amount of radiant energy of wave lengths largely within the
infra red portion of the spectrum and up into the middle of the visible section, so as to produce the maximum amount of radiant heat per unit of area of radiating surface.

It is of course essential that the radiating heat source 23 be small in area, since the image area, i.e. the throat 14, must of necessity be small to concentrate the heat on the relatively small head of the rivet. For this purpose, high resistance filaments enclosed in a glass envelope, which is substantially rarefied or filled with an inert gas such as nitrogen, works very well. It being understood that the more transparent the envelope to infra red rays, the higher the efficiency of the unit. It will also be understood, that most incandescent sources of light, even though giving out sufficient radiations in the visible spectrum to appear relatively white or yellow still have a very high percentage of their total radiant energy in the infra red portion of the spectrum.

While luminous gaseous discharge tubes may be used for the radiant source in my apparatus, these are normally not particularly effective since the quantity of effective heat radiated per unit of area of light source is relatively low, and consequently I prefer to use an electrical conducting body which will become incandescent upon the passage of current there through. Radio frequency waves are not suitable for my purpose, and I utilize only radiant energy having wave lengths in that area of the electro-magnetic spectrum which includes the infra red and the visible spectrum.

To facilitate rapid dissipation of heat absorbed by the housing 10 and particularly by the reflector 28 and the cone tip 15, I provide means for circulating a strong current of air through the housing immediately upon the deenergization of the radiant source 23. As mentioned, the handle 11 is preferably formed as a pistol grip and comprises a tubular housing 27 connecting at its upper end with an aperture 28 in the lower portion of the housing 10. The lower end of the pistol grip housing 21 is left open and preferably has a motor 29 and fan 30 axially mounted therein, leaving an air inlet port 31 of adequate size to allow a free flow of air therethrough when the fan blade 30 is rotated. Because of the relatively small size of the orifice or throat 14, additional vent holes 32 may be provided in the housing 10 to permit the rapid passage of a relatively large amount of air through all parts of the housing 10. To further insure the continued operation of the rivet gun at a normally moderate temperature, I also prefer to line the cone 13 or at least the throat thereof with a layer of asbestos 33 and provide the chambers 34 and 35 between the reflector 26 and the rear housing portion 12, which may be either vented to the atmosphere as shown or filled with heat insulating material such as asbestos or the like.

The gun is preferably operated by a trigger switch 36 which is connected through the master switch 25 to the filament circuit and the fan circuit so that when the trigger is pulled inwardly (to the right in Fig. 1), the filament circuit is closed, thus energizing the filament 22 to detonate the rivet being operated on. With the trigger switch 36 in this position, the circuit to the fan motor 29 is broken, but when the trigger 36 is released, the filament circuit is broken and the fan circuit is made, thus immediately forcing a current of air through the gun and cooling the heated parts thereof. The master switch 25 controls both the fan and filament circuits, so that when the gun is not in use both circuits are open. However, when the riveter starts operating on a given piece of work, the master switch 25 is closed which closes the motor switch, thus operating the motor until the trigger switch 36 is operated, which as above explained turns off the motor 29 and energizes the filament 22.

While normally the reflector 28 is adequate to concentrate sufficient heat rays through the throat 14, it may be advisable in some instances to provide a condenser lens 40, which because it is optional equipment I have shown in broken lines only. In this case the cone 13 is preferably provided with an annular lens-holding shoulder 41 and a snap ring groove 42, as shown. It will also be apparent that the tip 15 of the cone can be made removable so that tips of various sizes for the different size rivets may be used.

From the foregoing, it will be seen that I have provided a very efficient method of detonating explosive rivets and a device using that method which is highly efficient and portable. It is to be understood, however, that while the form of my device herein shown and described is now deemed to be my preferred embodiment and is fully capable of accomplishing the objects and providing the advantages hereinbefore stated, that it is merely illustrative of the broad concept of my invention as defined in the appended claims, and that I mean to include therein all patentable equivalents thereof.

I claim:

A rivet detonating gun, which includes: a conical housing provided with an aperture at its apex, and a seat for engaging a rivet head; a source of infra-red radiant energy disposed in the rear portion of said housing; a reflector in said housing for directing rays from said energy source and focusing the same on said rivet receiving portion of said cone; switch means for controlling the energization of said energy source; a handle attached to said housing and provided with a blower for directing a current of air through said housing upon the de-energization of said energy source; and switch means adapted to energize the circuit of said blower when said switch is open and to de-energize the same and energize the radiant energy circuit when said switch is closed.

Morton B. Leskin.
CERTIFICATE OF CORRECTION.


MORTON B. LESEKIN.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, second column, line 39, for the numeral "16" read --15--; page 2, first column, line 16, for "sources" read --source--; line 18, for "while" read --white--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 20th day of March, A. D. 1945.

Leslie Frazer
(Seal)
Acting Commissioner of Patents.