

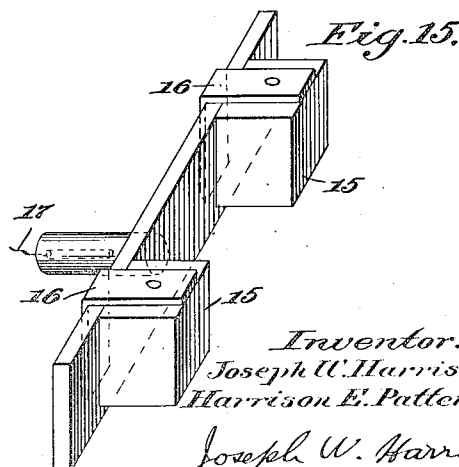
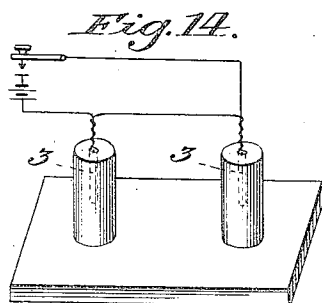
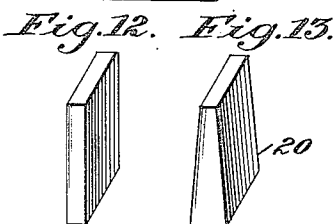
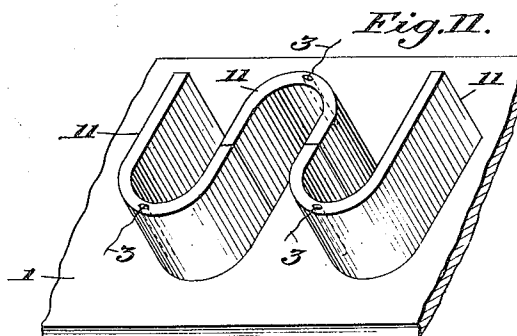
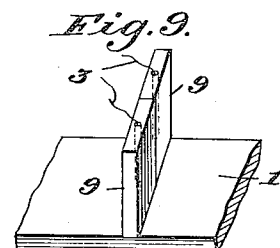
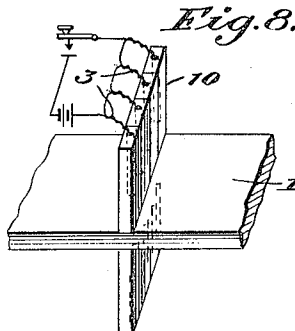
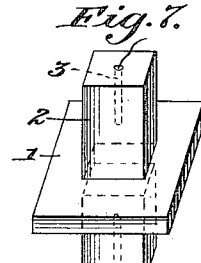
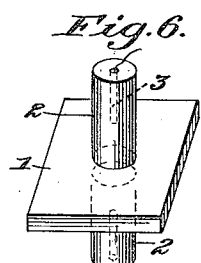
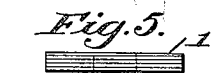
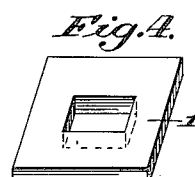
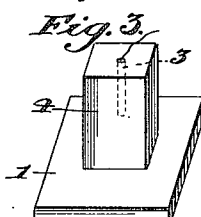
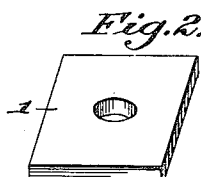
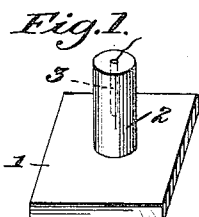
March 31, 1925.

1,531,555

J. W. HARRIS ET AL

ART OF PERFORATING AND SEVERING METALS

Filed July 31, 1924



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UNITED STATES PATENT OFFICE.

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ART OF PERFORATING AND SEVERING METALS.

Application filed July 31, 1924. Serial No. 729,252.

To all whom it may concern:

Be it known that we, JOSEPH W. HARRIS and HARRISON E. PATTEN, citizens of the United States, and residing at Washington, District of Columbia, and Silver Spring, in the county of Montgomery and State of Maryland, have invented certain new and useful Improvements in the Art of Perforating and Severing Metals, of which the following is a specification.

This invention relates to the art of perforating and severing metals, such as sheet metal, metal beams, plates, etc.

An object of the invention is to provide a means to perforate or cut metal in desired shapes without the use of cutting tools, acetylene flames, electricity, or similar agencies requiring plant equipment and accessory appliances;

A further object is to provide a perforating or cutting means that is economical in time, and in cost of materials necessary to do the work;

A further object is to provide a perforating or cutting means that is self-contained, and that can be placed upon the metal to be operated upon even though the metal be in a relatively inaccessible place;

A further object is to provide a perforating or cutting means which is small, convenient to handle, and may be prepared from its components at the place where it is to be used;

A further object is to provide a cartridge-like object, in various shapes containing sufficient latent energy which when liberated will perforate or sever the metal to be operated upon;

A further object is to provide a safe and convenient means of perforating and severing metal, that is complete in itself, and does not require expert labor to operate it;

Further objects will appear upon a reading of the specification.

The invention consists in placing practically in contact with the metal to be perforated or severed, a body of a suitable anilite, or other high explosive, having a short time-factor, and having a base area of substantially the shape of the desired perforation, and also a mass sufficient to contain enough latent energy which when liberated upon the localized area, will accomplish the required work. The anilite or

other explosive used may be in liquid form, or may be a liquid absorbed by an inert porous solid, such as sil-o-cel, sawdust, paper pulp, asbestos, etc., or absorbed in a semi-solid material, such as a gelatinous mass; or it may be a solid, or a composition or mixture of both liquid and solid anilites or explosives, or combined anilite and other explosive. If a liquid, or a soft gelatinous body, it should be placed in a container of the shape of the desired perforation; if sufficiently solid or viscous to retain its shape for a reasonable time, such as certain waxes, or stiff putty, it may be shaped by hand or by moulds into a desired shape. A suitable container for some cases would be suitably waxed, varnished, or silicated paper; or other material which did not offer substantial mechanical resistance when the charge was exploded. If the anilite or other explosive is a solid, it may be painted or varnished or otherwise coated with a suitable water-proof coating not offering substantial mechanical resistance to the explosion.

Suitable anilites, or explosives, for this work, are mixtures of hydrocarbons, or hydrocarbon compounds, with substances rich in oxygen, which oxygen is readily released. A mixture of benzene and liquid nitrogen dioxid, NO_2 , in nearly molecular proportions, to insure a complete reaction, with a slight excess of one of the components when necessary to serve as a restrainer. The anilite or mixture with other explosives may be prepared at the place where it is to be used; or with explosives which do not deteriorate rapidly, it may be made and shaped as desired at a factory and shipped to the place of use.

Other anilites than the mixture of benzene and nitrogen dioxid may be used; for example, mononitrobenzene and an oxid of nitrogen; dinitrobenzene and an oxid of nitrogen; naphthalene and an oxid of nitrogen; anthracene and an oxid of nitrogen; alpha naphthol and an oxid of nitrogen; beta naphthol and an oxid of nitrogen, also, substituted hydrocarbons, such as toluol, or substituted compounds of naphthalene, etc., may be used in place of the benzene; also, such explosives as amatol, tri-nitro-toluol, or other explosive which "fires" or explodes at an exceedingly rapid rate, as distin-

guished from a slow firing explosive, may be used. It is preferable that the anilite or other explosive, liberate essentially all of its latent energy at once, at an exceedingly rapid rate, thereby producing an exceedingly high temperature, with corresponding pressure, and considering the time-factor, representing a prodigious amount of energy, the temperature being sufficient to heat and volatilize matter immediately adjacent the charge, and pressure sufficient to blow out the volatilized matter. With a suitable anilite or other explosive, a properly proportioned and shaped charge placed upon a sheet of iron one-half inch thick will upon detonating, with a suitable detonating cap, perforate the iron, producing a hole substantially the size and shape of the cross section of the body of the explosive cartridge, with frequently a slight burr on the other side at the rim of the hole. A charge of anilite in a container, having a volume of about two hundred and fifty cubic centimeters, with a circular base of about two inches in diameter, perforated a steel plate three-eighths of an inch thick.

In the accompanying drawings,

Figure 1 illustrates a metal plate with a circular cartridge of explosive placed upon it;

Fig. 2 represents the metal plate showing the perforation produced by the explosive cartridge;

Figs. 3 and 4 show a metal plate before and after exploding a rectangular cartridge;

Fig. 5 illustrates a cross section of the plate showing a slight burr on one side;

Figs. 6, 7 and 8 illustrate metal plates with explosive cartridges on both sides;

Fig. 9 shows a plate about to be severed by a flat explosive cartridge, and Fig. 10 after the plate has been severed;

Fig. 11 shows a plate to be perforated with a definite pattern, the cartridge having the shape of the pattern;

Figs. 12 and 13 illustrate cross sections of cartridges. Fig. 11 having a uniform cross section, while Fig. 12 has a tapering cross section, towards the upper end;

Fig. 14 illustrates a plate to be perforated in more than one place at the same time, the explosives being set off electrically;

Fig. 15 illustrates the temporary application of masses of metal on the reverse side of the beam to be perforated to increase the inertia of the beam; an explosive cartridge is shown placed on the working side.

In Fig. 1, upon a plate of metal 1 to be perforated, is placed an explosive cartridge 2 having a cross section similar to the perforation desired, in the illustration it is circular. The explosive may rest upon the plate, or may be attached thereto by a thin layer of rubber cement, quick drying cement, etc., which will make a thin tight

joint, and at the same time exclude air. A detonating cap or electric fuse 3 is shown embedded in the cartridge.

Fig. 2 illustrates the perforated plate after the explosive has been fired. In Fig. 3, the plate 1 has a rectangular explosive cartridge 4 placed upon it, for producing a rectangular hole 5, shown in Fig. 4. For producing holes of special shapes, the explosive cartridge should be similarly shaped, and may, if desired, consist of several cartridges assembled into a unit and fired simultaneously by electricity, as in Figs. 8, 11, 14. A slight burr 6 is sometimes produced on the reverse side of the plate, as shown in Fig. 5, exaggerated.

In Figs. 6, 7 and 8, the plates 1 are provided with explosive cartridges 7, 8, 9, on both sides, and fired electrically; this method is to be used for thicker metal, and serves also to apply the pressure on both sides; the perforation produced is slightly larger than with the explosive on one side only.

For severing a metal plate, as shown in Figs. 8 and 9, a large flat explosive cartridge 9 is provided, or several small ones, 10, assembled, and fired electrically. For cutting patterns in a plate, the cartridge may have the shape of the pattern, or may be assembled from several smaller cartridges, as shown at 11 in Fig. 11. In Figs. 12 and 13 are shown end views of explosive cartridges, Fig. 12 showing the sides parallel, while in Fig. 13 the sides taper toward the top, or outer edge, the base portion 20 to have the area of the desired perforation, and to be of larger area than the average cross section of the cartridge.

In Fig. 14 is shown the perforating of more than one hole at one time, by simultaneously exploding electrically a cartridge for each perforation.

In Fig. 15 is shown the application of masses of metals 15, suitably temporarily suspended by brackets 16 on the plate 1. A cartridge 17 is shown attached to the side opposite the weights, and between them. The masses of metal need not be regularly used, but in special cases, it may be desirable to reduce any shock to a minimum.

What is claimed is:

1. The method of perforating or cutting metals, which comprises placing in close contact therewith a predetermined mass of pre-shaped high explosive having a short time-factor, and detonating said high explosive.
2. The method of perforating or cutting metals which comprises placing in close contact therewith, a predetermined mass of a high explosive having a short time-factor, said explosive having a base cross section of a shape and dimensions substantially equal to the area of the perforation or cut desired.
3. The method of perforating or cutting metals which comprises placing in close con-

tact therewith a pre-determined mass of a high explosive having a short time factor, said explosive to have a firm air-excluding contact with said metal, and detonating said explosive.

4. The method of perforating or cutting metals which comprises placing in close contact with the metal on both sides, pre-determined quantities of pre-shaped masses of explosive, and detonating said masses of explosive simultaneously.

5. The method of perforating or cutting designs or patterns in metal, which comprises placing in close contact with said metal, a pre-determined mass of high explo-

sive having a short time-factor, said explosive having its base of a shape and size substantially the same as that of the pattern, placing the base in registry with said pattern, and detonating said explosive.

6. The method of perforating or cutting metals, which comprises placing in close contact with the metal a pre-determined mass of a high explosive, and providing a shock-absorbing mass on the other side of the metal near the area of the desired perforation.

In testimony whereof we hereby affix our signatures.

JOSEPH W. HARRIS,
HARRISON E. PATTEN.