Feb. 17, 1953

R. JASSE

2,628,559

EXPLOSIVE DRILL

Filed Feb. 12, 1946

2 SHEETS--SHEET 1

Fig. 1

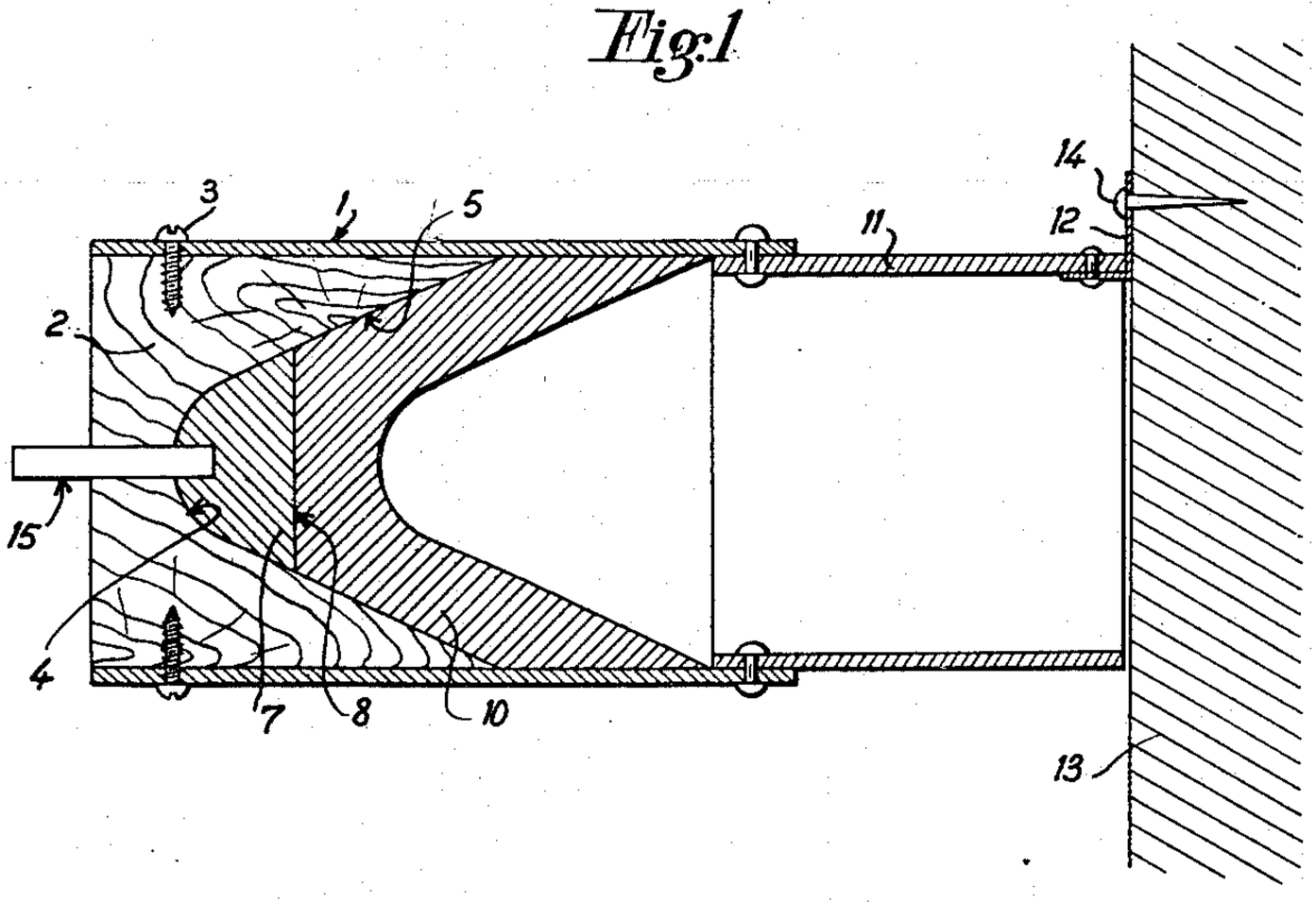
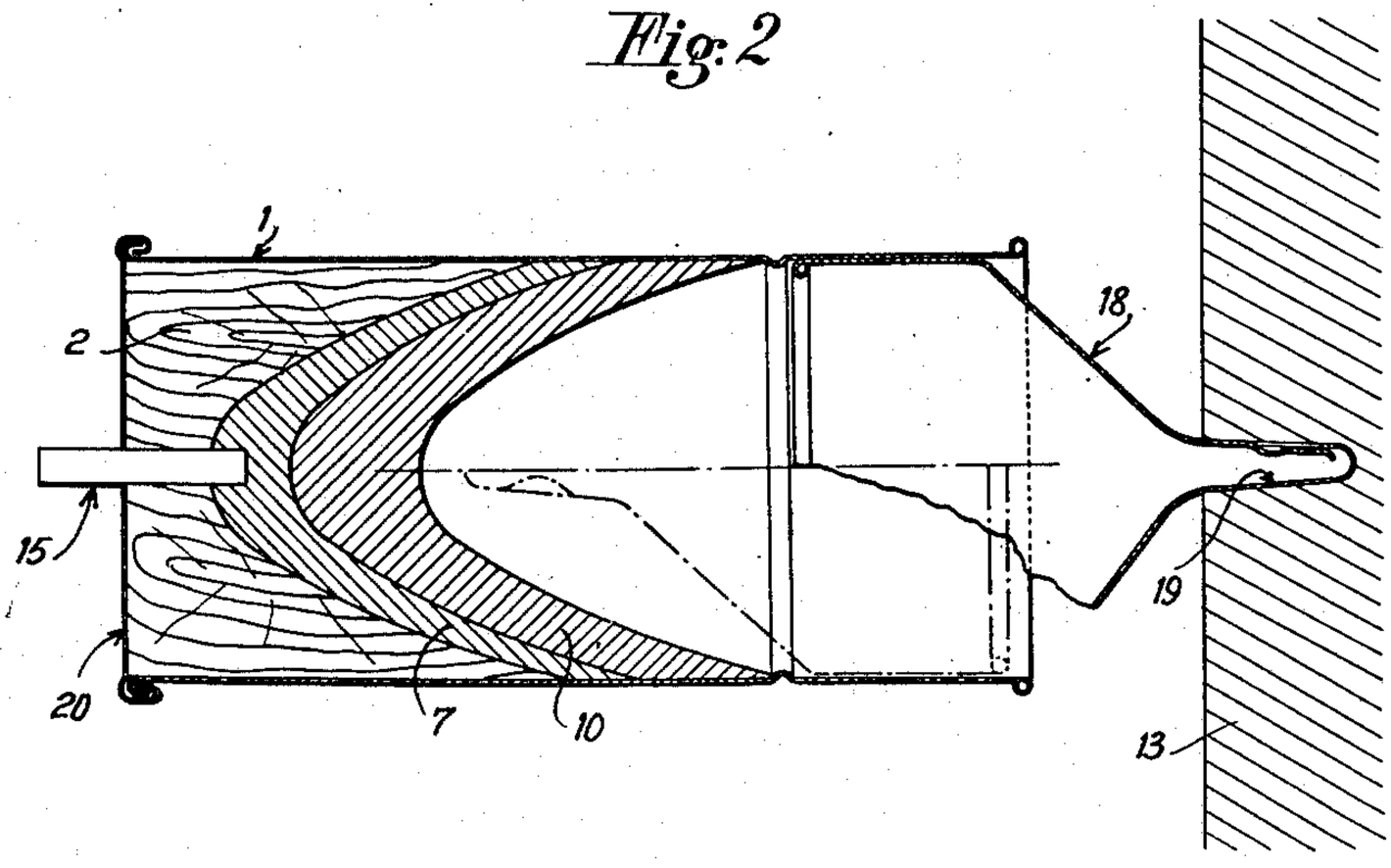


Fig. 2



INVENTOR:
RAYMOND JASSE

By Richardson, David and Nordon

Atty's

Feb. 17, 1953 R. JASSE 2,628,559

EXPLOSIVE DRILL

Filed Feb. 12, 1946 2 SHEETS—SHEET 2

Fig. 3

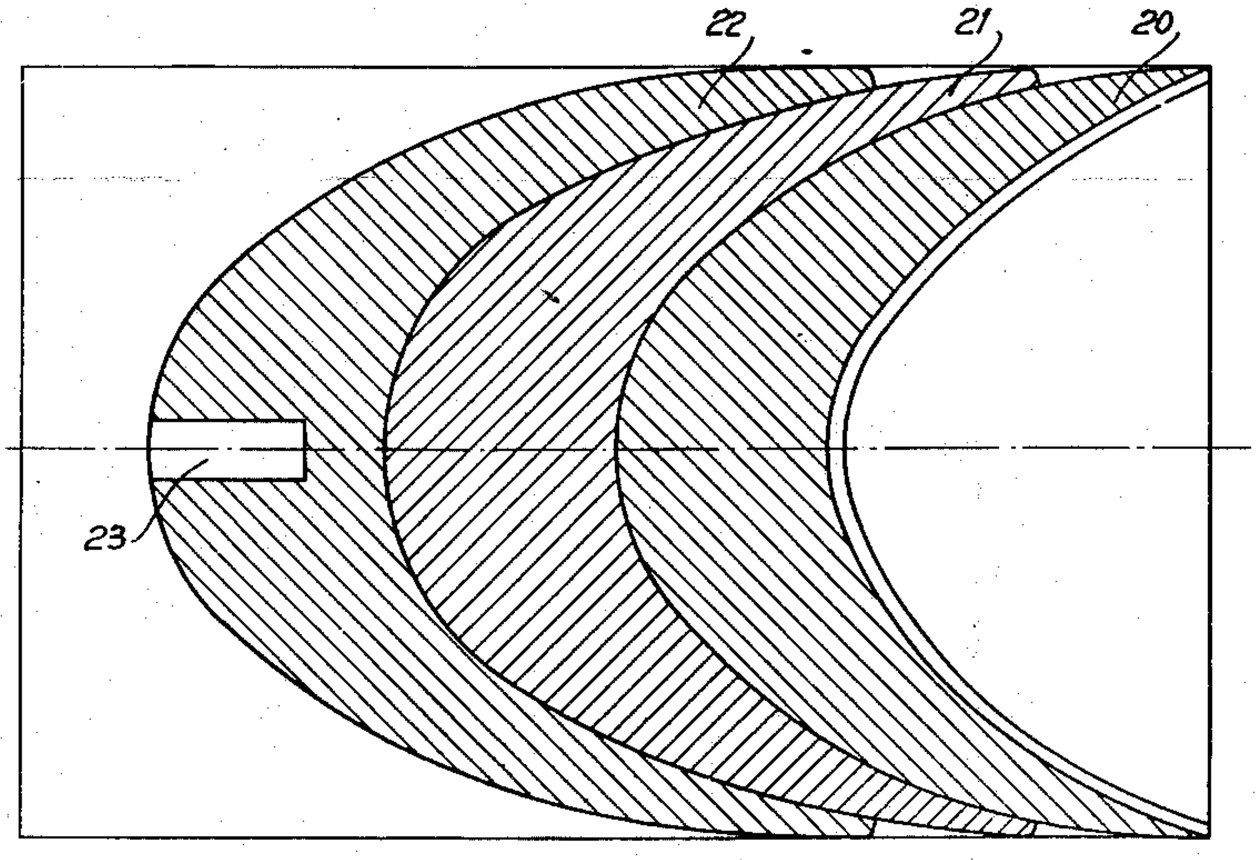
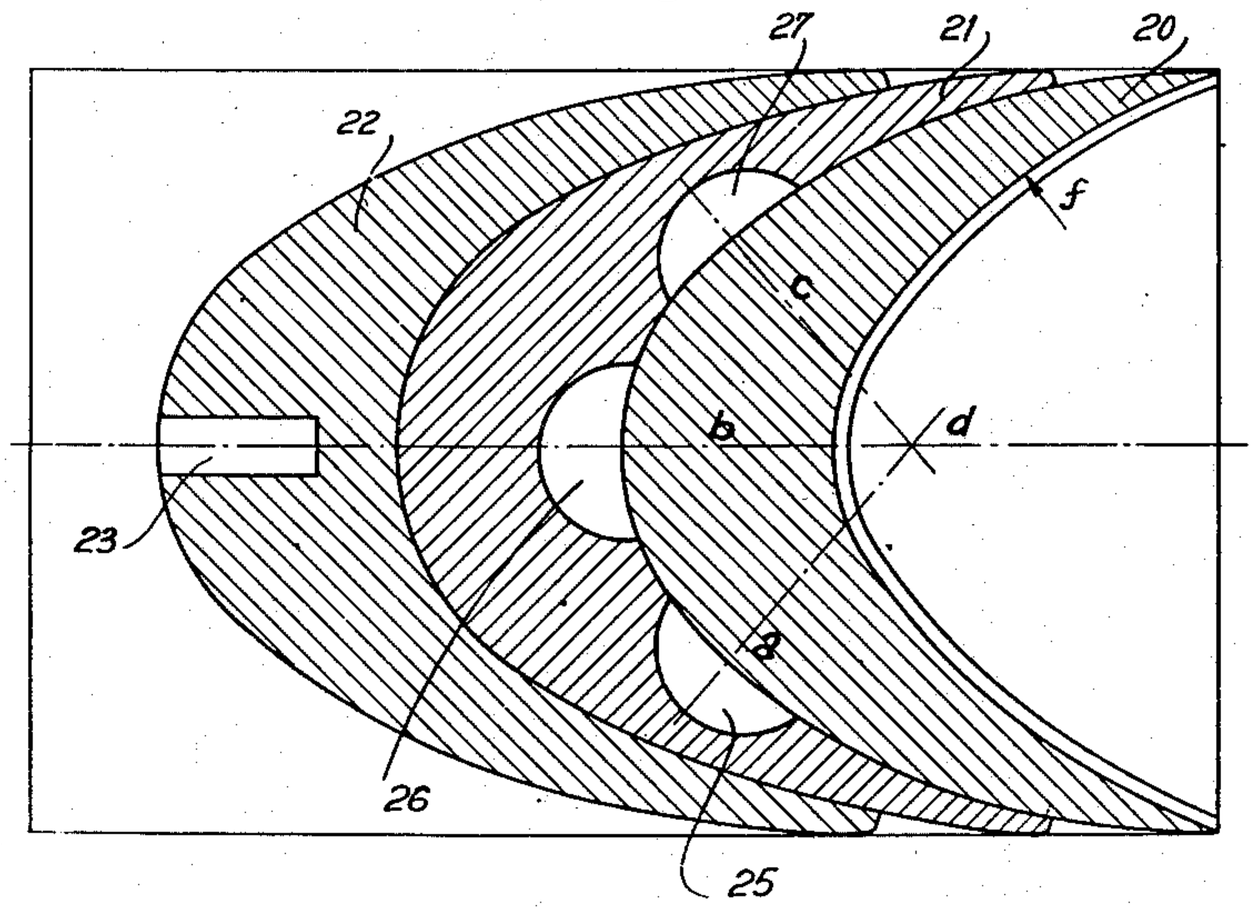


Fig. 4



Raymond Jasse
INVENTOR
By Richardson, Davis and Nordin
his ATT'YS.

Patented Feb. 17, 1953

2,628,559

UNITED STATES PATENT OFFICE

2,628,559

EXPLOSIVE DRILL

Raymond Jasse, Paris, France, assignor to Societe dite: Centre d'Etudes, M. B. A., Paris, France

Application February 12, 1946, Serial No. 647,069
In France February 6, 1945

Section 1, Public Law 690, August 8, 1946
Patent expires February 6, 1965

2 Claims. (Cl. 102—24)

1

This invention has for its object an explosive drill or perforator which is of general use for boring operations, demolitions, destructions and parcelling operations and is more particularly intended for use in boring a deep hole in a predetermined direction in any natural or artificial obstacle.

According to certain features of the invention, the improved perforator comprises a casing having a longitudinal axis of symmetry, made of a light material such as cardboard or sheet metal, and housing from rear to front at least one priming charge in contact by a relatively wide surface with a main explosive charge provided with a cavity or recess flaring towards the front end of the casing, a fixation device being secured to said front end in order to maintain a predetermed spacing between the fore plane of said cavity and the surface of the obstacle to be bored.

Other features of the invention will appear from the following description.

In the accompanying drawings given by way of example:

Fig. 1 is a longitudinal section of the device,

Fig. 2 is a similar view of a modified construction.

Figs. 3 and 4 show diagrammatically other arrangements of the charges.

In the example shown in Fig. 1, the drill or perforator comprises a cylindrical container or casing 1 of cardboard or metal closed at its rear end by a wooden plug 2 secured in the container by means of screws 3. The front or inner surface of said plug which is a surface of revolution coaxial with the casing comprises a central spherical part 4 and a flaring conical part 5. In front of the plug, the casing contains a priming charge 7 made of an explosive material piled up, cast or highly compressed. Said charge is contained in the bottom of the plug and is terminated at the front by a cross plane surface 8 of a comparatively great area. A blasting charge 10 is placed in front of said priming charge, the front surface of the same being a sphero-conical flaring surface coaxial with the casing and having a shape similar to the front face of the plug. The thickness of the composite charge in a direction parallel to the axis of the casing is substantially uniform at all points of its cross section.

The container 1 carries at its front end a tubular extension 11 open at both ends which is provided at its front end with attaching means such as a bracket 12 by means of which it may be readily secured to the obstacle 13 to be bored, as for instance by a nail 14.

2

When a perforating operation is to be made, the casing is fixed to the obstacle so that its axis coincides with the direction of the bore to be drilled and a combined detonator and fuze 15 is inserted through a hole provided axially in the rear end of plug 2 so as to contact with the priming or firing charge 7. The shot is then fired.

The initial impulsion imparted by the detonator fuze 15 is transmitted from the rear to the front first to the priming charge 7 and then to the explosive charge 10. The detonation is propagated frontwards by a decomposition of the main charge in successive layers having a shape corresponding substantially to the shape initially given to the rear part of said charge. In this manner the explosive waves are directed and concentrated towards a point located ahead somewhere on the axis of the casing, i. e. on the axis of perforation. By this means a maximum concentration of the explosive waves is obtained in the desired direction with a minimum weight of explosive material. The device has thus a high efficiency.

The casing being made of a light material can be easily manufactured at reduced costs. The device is not heavy and can be easily manipulated and it ensures a very small projection of inoffensive splinters.

The length of the tubular extension 11 is so calculated that when the device is in firing position the front face of the whole pyrotechnical body will be located at a distance from the obstacle corresponding to the maximum efficiency. Said distance, which varies according to the shape of the charges and the material constituting the obstacle is in all cases less than 1.5 the diameter of the charge. By merely placing the front end of the extension in contact with the obstacle, the device will thus be used in the best conditions.

Instead of the shape described above, the front faces of the plug, priming charge and blasting charge may have the shape of other surfaces of revolution of a conoidal character such as a paraboloid, an ellipsoid, etc. as shown in Fig. 2.

In this case, instead of being plane, the contact surface between the priming charge and the blasting charge has such a shape that the priming charge will partly envelop the blasting charge.

Such an arrangement is of peculiar advantage, when the blasting speed of the priming charge is higher than that of the main charge. Firstly it ensures a substantially simultaneous lighting at all points of the contact surface between the priming charge and the main charge, so that the

propagation of the detonation in said main charge occurs by successive layers shaped as bodies of revolution, which increases the piling up effect within the charge.

Secondly, it ensures an increase of concentration of the blasting effect in the axial direction of the structure, due to the "refraction" of the detonation waves when passing from the priming charge to the blasting charge.

In this manner the efficiency of the perforator is increased due to a better concentration of the blasting effect in the axial direction of the device.

In some cases, it may be desirable to adjust with a greater accuracy the direction of the axis of perforation. For this purpose, the device is completed by a funnel shaped hollow member 18 (Fig. 2) having removably and telescopically engaged in the free end of the casing 1. A short hole 19 having a small diameter is drilled in the face of the obstacle or structure to be bored. In operation, the reduced end or nozzle of said funnel member 18 is introduced into said hole. The device is thus given at once a correct position in which it is properly secured on the obstacle or structure to be drilled.

The construction may be so devised that for storing and handling purposes the funnel will be placed inside the casing extension in an inverted position, as shown in dotted lines in the lower part of Fig. 2. The bulk of the whole device is thus reduced and the funnel acts as a protective covering for the front end of the same.

The plug 2 may be composed of separate pieces of wood or cardboard or by a body of an inert material such as earth or kieselguhr, which will not become agglomerated or solidified under physical or chemical actions (shocks, heat, etc.). Said body is held at the rear end of the casing by an end wall 20, as shown in Fig. 2. In said figure, the casing is made of sheet metal.

Fig. 3 shows another modification in which a plurality of priming charges is provided. In said figure, the blasting charge 20 is partly enveloped by a priming charge 21 which is itself partly enveloped by a priming charge 22 at the top of which is provided a recess 23 for housing the detonator fuse. The shape of the charges is of the type described with reference to Fig. 2. As shown approximately in Fig. 3, the solid angle at the apex of each charge gradually increases from one charge to the next, from the rear end to the front end of the device. Moreover the explosive materials constituting the various charges are chosen of different grades or are compressed differently one from another so that the detonation speed in the charges will progressively decrease from the rear end to the front end of the device.

In this manner, the concentration of the detonation waves along the axis of the device will progressively increase from the first priming charge 22 which is fired directly by the detonator fuse to the second priming charge 21 and then to the blasting charge 20, which will increase the efficiency of the device.

Fig. 4 shows a further modification in which recesses 25, 26, 27 are formed in the outer face of the second priming charge 21, which may be considered as an intermediary priming charge or an orientation charge. Said recesses are so arranged that their axial lines such as *a*, *b*, *c* will converge to a point *d* located on the axial line of the casing, which is also the axis of the recess or cavity formed by the outer face *f* of the blasting charge. By providing such recesses, the concentration of the blasting waves along the casing axis is further increased. Said recesses could be bodies of revolution and have an annular or toroidal shape.

The whole of the priming and blasting charges can be wrapped in a light envelope made of paper, cardboard or metal, according to the shape and nature of the constituents of the charges, so that they may be introduced more easily into the casing.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:

1. In an explosive drill having an outer casing having a base portion closing one end thereof whilst the other end is open and free and a drill hollow charge in said casing adjacent said base portion, means for securing said drill to the structure to be drilled comprising a sleeve engaging the free open end of the casing, a substantially funnel-shaped member attached to the outer end of said sleeve, said member terminating in a tube adapted to enter a hole of small diameter in the structure to support the drill on the structure.

2. In an explosive drill having an outer casing having a base portion closing one end thereof whilst the other end is open and free and a drilling hollow charge in said casing adjacent said base portion, means for securing said drill to the structure to be drilled comprising a sleeve, engaging the free open end of the casing, a conical member secured to the free end of the sleeve and an elongated tube secured to the reduced end of the conical member, the tube being adapted for insertion into a hole of small diameter provided in the structure to be drilled to secure said drill in the structure.

RAYMOND JASSE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
356,064	France	Jan. 11, 1887
1,029,051	Dutcher	June 11, 1912
1,088,606	McGinley	Feb. 24, 1914
1,406,844	Gelm	Feb. 14, 1922
1,440,601	Holran	Jan. 2, 1923
1,531,555	Harris et al.	Mar. 31, 1925
1,534,011	Watson	Apr. 14, 1925
1,534,012	Watson	Apr. 14, 1925
2,247,169	Gilbertson	June 24, 1941
2,407,093	Mohaupt	Sept. 3, 1946
2,419,414	Mohaupt	Apr. 22, 1947
2,420,201	Seavey	May 6, 1947

FOREIGN PATENTS

Number	Country	Date
20,110	Great Britain	of 1911
28,030	Great Britain	1911
113,685	Australia	Aug. 1941

OTHER REFERENCES

"Zeitschrift Fur Das Gesamte Schiess und Sprengstoffwesen," pages 183–187, Article by E. N. Darmstadt (May 15, 1914).

The Illustrated London News (Nov. 25, 1944), "The Hollow Charge," pages 604–605.

"The Explosives Engineer" (July–August 1945), Article by Volta Torrey, pages 160–163.