Nov. 29, 1949

C. C. WHITE

2,489,349

MINE EXPLODER

Filed Dec. 13, 1944

3 Sheets-Sheet 1

Fig. 6.

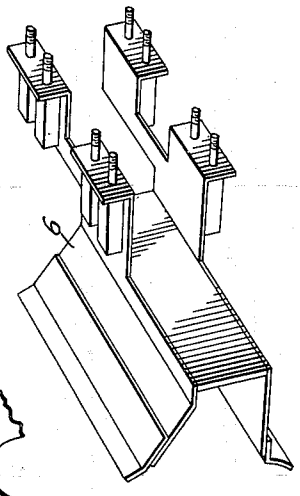


Fig. 7.

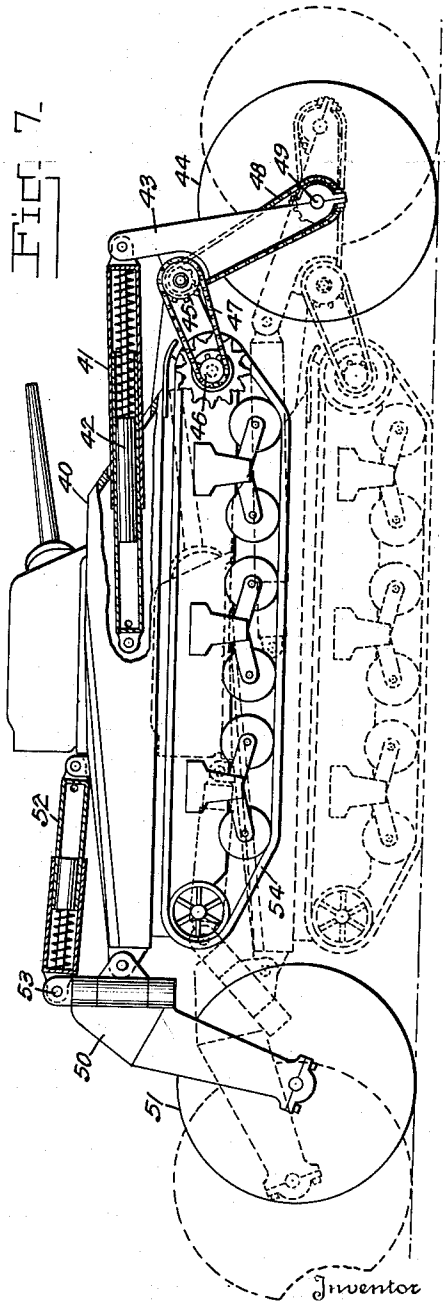
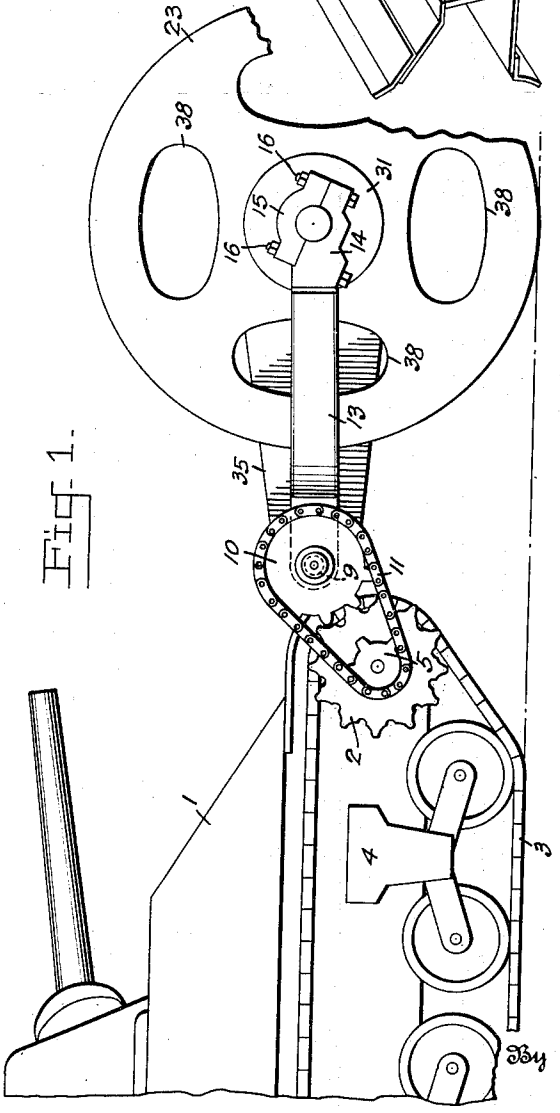


Fig. 1.



Inventor

Claude C. White

By C. E. Herrstrom & H. E. Thibodeau

Attorneys

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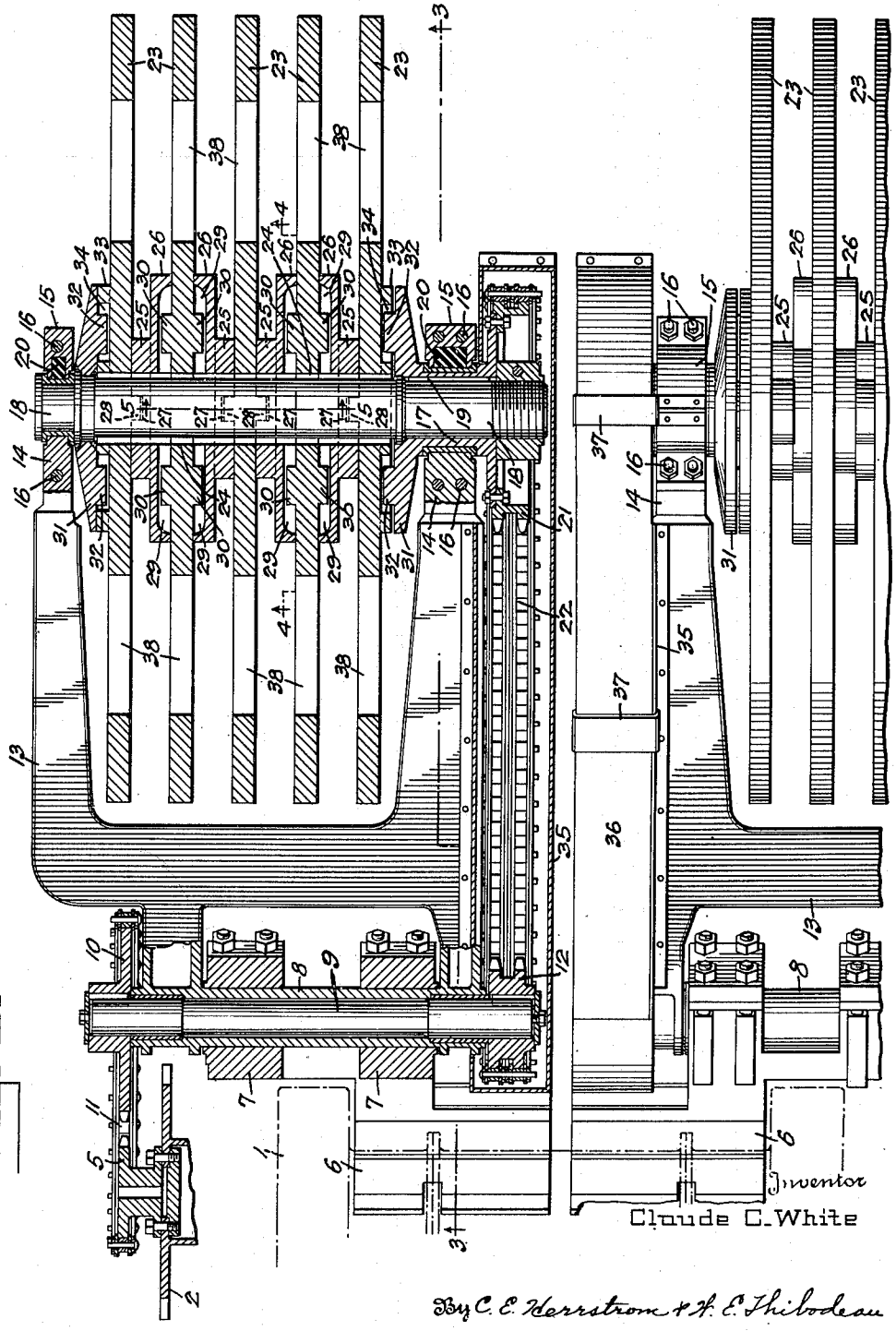


Fig. 2.

Inventor
Claude C. White

By C. E. Herrstrom & H. E. Thibodeau
Attorneys

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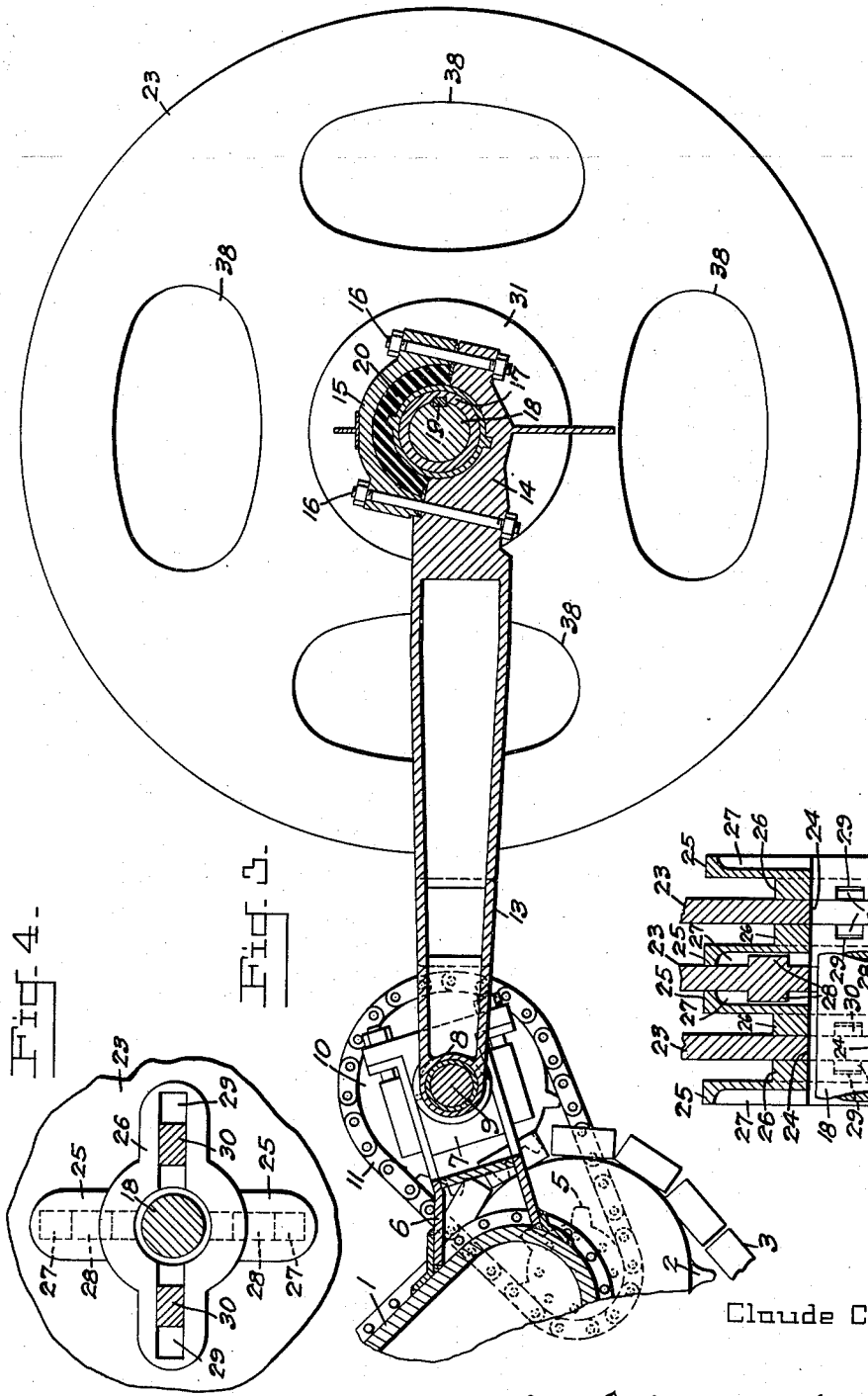


Fig. 4.

Fig. 5.

Inventor
Claude C. White

By C. E. Herrstrom & H. E. Thibodeau

Attorneys

Patented Nov. 29, 1949

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UNITED STATES PATENT OFFICE

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MINE EXPLODER

Claude C. White, Aberdeen, Md.

Application December 13, 1944, Serial No. 568,026

2 Claims. (Cl. 55—6)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

The present invention pertains to a novel apparatus for exploding mines that have been planted in the earth. One of the expedients previously suggested is a series of discs mounted in front of a vehicle and pushed thereby. It was found however that such discs are not satisfactory principally because they cannot readily be pushed out of craters and also because they diminish the tractive efficiency of the vehicle.

The object of this invention is to overcome these objections and is accomplished essentially by providing a power drive for the discs. In the case of a combat tank, for example, the drive is taken from the drive sprocket.

Another object of the invention is to construct the discs so that they absorb comparatively little energy from an explosion and are lifted a relatively short distance off the ground by the acquired energy. These functions result from a proportioning of the discs by calculations based on experiment and observation. The principles involved in proportioning the discs are set forth hereinafter.

An illustrative embodiment of the invention is disclosed in the following description and in the accompanying drawings in which:

Figure 1 is a side elevational view of my novel mine exploder;

Figure 2 is a fragmentary plan view in cross-section of my novel mine exploder;

Figure 3 is a side elevational view with parts broken away of my novel mine exploder;

Figure 4 is a view taken on the line 4—4 of Figure 2;

Figure 5 is a fragmentary sectional view on the line 5—5 of Figure 2 along axis of the disc of my novel mine exploder;

Figure 6 is a perspective view of the connecting member of my novel mine exploder, and

Figure 7 is a side elevational view of a modified form of my invention.

In Figure 1 is shown a heavy vehicle 1 such as a combat tank having a drive sprocket 2 at each side at the forward end. The sprockets drive tracks 3 running under bogies 4 in the usual manner. To the face of each sprocket 2 is bolted a power take-off sprocket 5 for driving the mine-exploding discs as will presently be shown.

To the forward end of the tank is fastened a suitably shaped supporting bracket 6, at each side of the center line of the tank. Each support has fastened thereto a split bearing 7 receiving a

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bushing 8 and a shaft 9. The end of each shaft adjacent to a sprocket 5 carries a larger sprocket 10 geared to the corresponding sprocket 5 by a chain 11. The inner end of each shaft 9 carries a double sprocket 12 for a purpose that will presently be described.

On each sleeve 8 is mounted a fork 13 extending some distance forward of the tank. Each forward end of each fork is formed as a bearing pillow 14 fitted with a cap 15 secured by bolts 16. In the bearings thus formed are mounted sleeve 17, 17' containing a shaft 18 secured by keys 19. The cap is hollow and contains a rubber shock absorber 20. The inner end of each shaft carries a double sprocket 21 geared to the alined double sprocket 12 by chains 22.

On each shaft 18 are mounted several large and relatively thin discs 23, each having a central hole 24 which is considerably oversized around the shaft 18 as clearly shown in Figure 5. Between adjacent discs are mounted coupling members, each consisting of a plate 25 engaging one of the discs and to which is welded a smaller plate 26 engaging the other disc. Each disc 25 is formed with a pair of diametrically alined slots 27 in the face adjacent to a disc 23. That disc carries on each face a pair of diametrically alined keys 28 received in the adjacent slots 27. This arrangement occurs at alternate discs.

Each of the smaller plates 26 has a pair of diametrically alined slots 29 formed in the face adjacent to one of the remaining discs and perpendicular to the slots 27. The last named or remaining discs carry diametrically alined keys 30 received in the slots 29.

At the ends of the assembly are end plates 31 fastened respectively to the sleeves 17, 17' and carrying diametrically alined keys 32 parallel to the keys 28. The outer face of each end disc of the discs 23 carries a plate 33 having diametrically alined slots 34 receiving the keys 32.

Each disc 23 is thus permitted to shift independently relatively to the shaft 18 in response to irregularities of ground surface. The couplings constituted by the keys and the members between adjacent discs constitute the drive from disc to disc, which is initiated at the keys 32 and plates 31, the latter being secured to the shaft 18. The disc couplings, displaceable in two directions, are in the nature of universal joints and are commonly known as mechanic's joints.

Each pair of sprocket chains 22 is preferably enclosed in a guard 35 having a detachable cover 36 held by suitable clips 37.

The characteristics will be given for an appa-

ratus designed to explode mines containing about 12 pounds of TNT without material damage to the apparatus. Each fork carries five discs about 8 feet in diameter and 3½ inches thick. Such a disc, consisting of armor plate is cored out at several holes **38** to reduce the weight of each disc to about 4600 pounds. The projected ground area of each disc is 2 inches times 8 feet or 1⅓ square feet. The weight of each disc is 1971 pounds per square foot of exposed area.

The high ratio of disc diameter to disc thickness, on the order of 30 to 1 is significant. The energy delivered by an explosion to an adjacent mass is proportional to the exposed, effective area of the mass. This energy is converted in the mass into two forms, namely, kinetic or lifting energy and stress within the mass. The lifting energy is obviously inversely proportional to the mass, and the stresses are therefore directly proportional to the mass. The mass receives a comparatively small amount of energy from the explosion, by reason of its relatively small thickness and small exposed area, and only a small portion of this energy is absorbed in lifting the mass, which is relatively heavy. The resulting small ascent of the discs from the ground signifies correspondingly small destructive forces due to falling impact.

Another important characteristic of the invention is the direct drive on the discs. It has been found that discs that are merely pushed by the vehicle travel with difficulty over rough ground and frequently cannot be pushed out of craters. Under favorable conditions the power required to overcome the rolling resistance of the discs is derived from the tank tracks and the track slippage is about 50%, with a corresponding reduction of mobility. On muddy difficult terrain the propulsive efficiency of the track is frequently reduced to zero.

The direct drive on the discs overcomes all of these difficulties. The discs roll readily out of craters and pits and also over normal obstructions. The speed of the vehicle is reduced to about 50% below normal, which is satisfactory for mine-exploding operations. The track efficiency, however, is not reduced since the disc drive is direct from the driving sprockets **2** and no driving effort is taken from the tracks.

The space between the two sets of discs is covered by a third set of discs centrally mounted on the rear end of the vehicle or by a similar trailing vehicle taking a laterally offset path. The latter arrangement also widens the path made by the leading vehicle.

In the modification shown in Figure 7, the tank **40** carries a pair of substantially horizontal pivotally mounted hydraulic jacks **41**. To the outer end of the ram **42** of each jack is pivotally attached a fork **43** in which is mounted a set of discs **44**. The fork carries a driven sprocket **45** geared to the drive sprocket **46** at the adjacent side of the tank by a chain **47**. Each sprocket **45** is similarly geared at **48** to the disc shaft **49** in the corresponding fork **43**.

To the rear end of the tank is pivotally mounted a single, central fork **50** carrying a single set of discs **51**. These need not be positively driven since they are effectively pulled over obstructing surfaces by the tractive effort of the two sets of forward driven discs **44**. Upon the rear deck of the tank is pivotally mounted a horizontal jack **52** having its moving end pivotally attached at **53** to the fork **50**.

The jacks are adapted to lift the vehicle and hold it off the ground as shown in Figure 7, and in this position the apparatus is propelled only by the discs **44**. It can travel in this condition over ground that is relatively hard and smooth. When more difficult terrain is encountered, the jacks are operated to lower the tank and bring its tracks **54** upon the ground.

While specific embodiments of the invention have been shown and been described, it will be understood that various alterations may be made without departure from the spirit of the invention as indicated by the appended claims.

What I claim is:

1. In combination with a vehicle having a power plant for propulsion and having a power take-off, a mine exploder comprising a frame pivotally attached to said vehicle, a shaft rotatively journalled in said frame, a series of spaced mine exploding discs loosely mounted centrally thereof on said shaft, coupling means between each of said discs and coupling all of the latter together rotatively, said coupling means including slots with keys slidably received therein, whereby each of said discs is subject to independent limited relative displacement radially of said shaft, couplings connecting the opposite ends of said series to said shaft, and a drive connection between said power take-off and said shaft for drive rotation of the latter, whereby said discs are rotatively driven by said power plant independently of ground contact.

2. In combination with a vehicle having a power plant for propulsion and having a power take-off, a mine exploder comprising a frame pivotally attached to the forward end of said vehicle, a shaft rotatively journalled in said frame, a series of spaced mine exploding discs loosely mounted centrally thereof on said shaft, each of said discs carrying on each of the opposite faces thereof a pair of spaced diametrically aligned keys, coupling plate members each loosely mounted on said shaft between respective adjacent keys of two of said discs and connecting all of said discs together rotatively, each of said coupling plate members having on each of the opposite faces thereof a pair of spaced diametrically aligned slots slidably receiving the respective said keys on the adjacent face of one of said discs, whereby each of said discs is subject to independent limited relative displacement radially of said shaft, coupling means connecting opposite ends of said series to said shaft, and drive means rotatively connecting said shaft to said power take-off, whereby said discs are rotatively driven by said power plant independently of ground contact.

CLAUDE C. WHITE.

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