Blasting Process and Means Therefor.

To all whom it may concern:

Be it known that I, FRANK W. CAMP, citizen of the United States, residing at San Francisco, county of San Francisco, State of California, have invented new and useful improvements in Blasting Processes and Means Therefor, of which the following is a specification.

My invention has for its object means for breaking up hardpan and other earth formations and particularly such earth formations as are resistant to excavation by conventional shovels or the like, or formations under water.

These objects I accomplish by preparing an explosive mixture within a casing and thereafter driving the said casing with its charge into the earth formation which it is desired to break up and then exploding the said charge while maintained in said position.

By referring to the accompanying drawings my invention will be made clear.

Fig. 1 is a detail of my driving or placing apparatus.

Fig. 2 is an enlarged cross section showing the explosive charge and its surrounding casing attached to the driver.

Fig. 3 is a partly diagrammatic view of the driver and casing in position prior to driving them into the earth, together with the mechanism for operating them.

Throughout the figures similar numerals refer to identical parts.

The numeral 1 indicates a gallows frame as used for pile driving or the like and having a pulley 2 and a hoisting engine 3 by which the cable 4 is raised or lowered carrying therewith the driver 5, preferably a piece of steel shaf ting 8 or 10 inches in diameter and 15 or 20 feet long and which is bored out on its lower end at 6 and may be partially sharpened as shown at 7 if desired. The attachment between the driver 5 and the cable 4 may be by any conventional means as the eyebolt 8. The explosive charge is shown at 9 enclosed within the casing 10 and I have found boiler tubing to be particularly well adapted for this. The casing is flattened or pointed as at 11 and a plug of inert material as cement, as shown at 12, is cast into the bottom of the casing.

At 13 is shown a percussion cap and at 14 a fuse which extends through the cover layer 15 and exposed at 16 before the casing 10 is inserted into the hole 6. I prefer to use dry cement as a layer of inert material at 15, this having the property of preventing moisture getting into the explosive mixture. The fuse may if desired be brought out of the side of the casing at the point indicated by the numeral 15.

At 17 is shown a stratum of hard pan or the like which it is desired to break up preparatory to excavating and which may in some cases lie below a water surface 18. At 19 is shown holding means between the driver and the casing.

The operation is as follows:

The gallows frame 1 is positioned over the hard pan which it is desired to excavate. The driving member 5 is raised to the top of the frame, the fuse 16 is lighted and the casing 10 is inserted into the hole 6 and the wedge 19 driven therein to hold the said casing in position. The clutch on the hoisting engine 3 is released and the driver 5 falls forcing the casing 10 into the hardpan and into the position shown in Fig. 1. The driver 5 is now hoisted, separating at once from the casing 10, which is held in frictional engagement with the hardpan or clay. The fuse which has been properly timed thereafter explodes the percussion cap 13 and the charge 9 causing the breaking up of the hardpan 17.

I claim:

1. The method of blasting refractory formation which consists in dropping a weighted charge container into said formation, removing the weight, and exploding the charge.  
2. The blasting process for breaking up refractory formations which consists of loading a charge of explosive into a casing adapted to be driven into the ground and then inserting the said casing in a weighted driving member and then dropping said member and said casing from a height whereby the casing is driven into the refractory material and then withdrawing the driving member and then exploding the charge.
3. The blasting process for breaking up refractory formations which consists of loading a charge of explosive into a casing adapted to be driven into the ground and then igniting a time fuse connected with
exploding means within said charge and then inserting the said casing in a weighted driving member and then dropping said member and said casing from a height whereby the casing is driven into the refractory material and then withdrawing the driving member before explosion of the charge.

4. A blasting charge, comprising a cylindrical casing pointed at one end and having a bottom plug, a charge of explosive material above said plug and means to explode said charge and a cap of inert pulverulent material at the other end of said casing and sealing said charge against atmospheric contamination.

5. Blasting apparatus comprising a cylindrical elongated weight member and a casing containing a blasting charge and means for separably engaging the casing at one end on one end of the weight member.

6. Blasting apparatus comprising a cylindrical elongated driving member and a casing containing a blasting charge and means for separably engaging the casing on one end of the driving member.

7. Blasting apparatus comprising a cylindrical elongated driving member and a casing containing a blasting charge and wedge means for separably engaging the casing on one end of the driving member and means at the other end of the driving member for suspending the same.

8. Blasting apparatus comprising a cylindrical metal shell pointed at one end, a hardened cement plug filling within the pointed end, a charge of explosive material above the plug with means to explode the charge extending from the shell, and a layer of dry cement powder above the explosive material.

FRANK W. CAMP.