

No. 775,600.

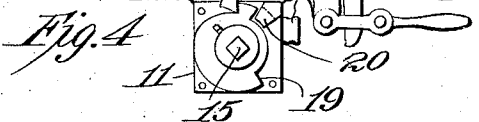
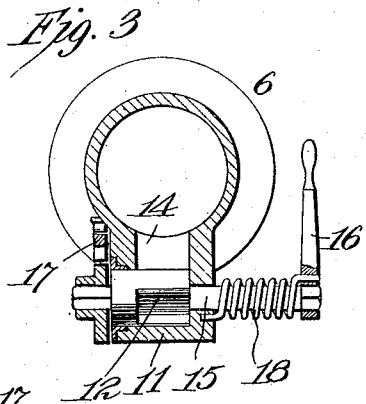
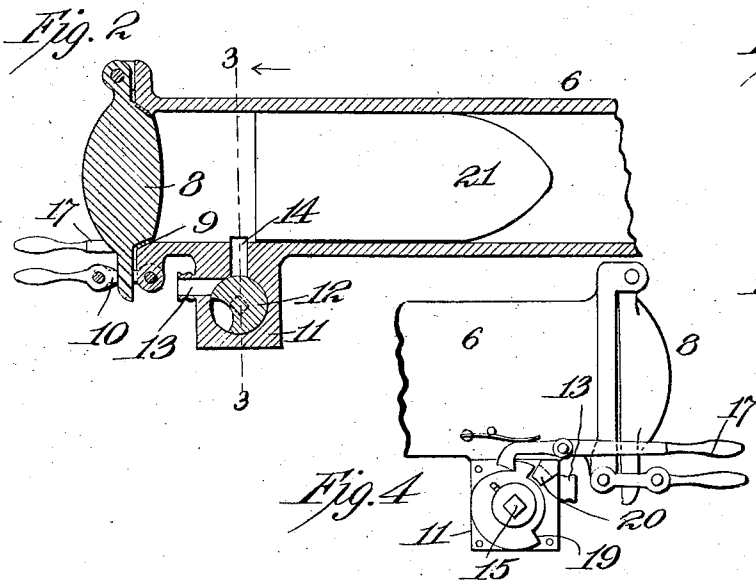
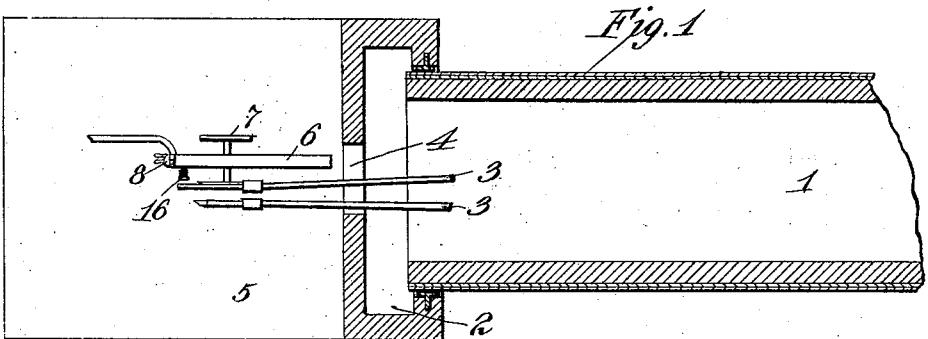
PATENTED NOV. 22, 1904.

T. A. EDISON.
ROTARY CEMENT KILN.

APPLICATION FILED JULY 22, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses:

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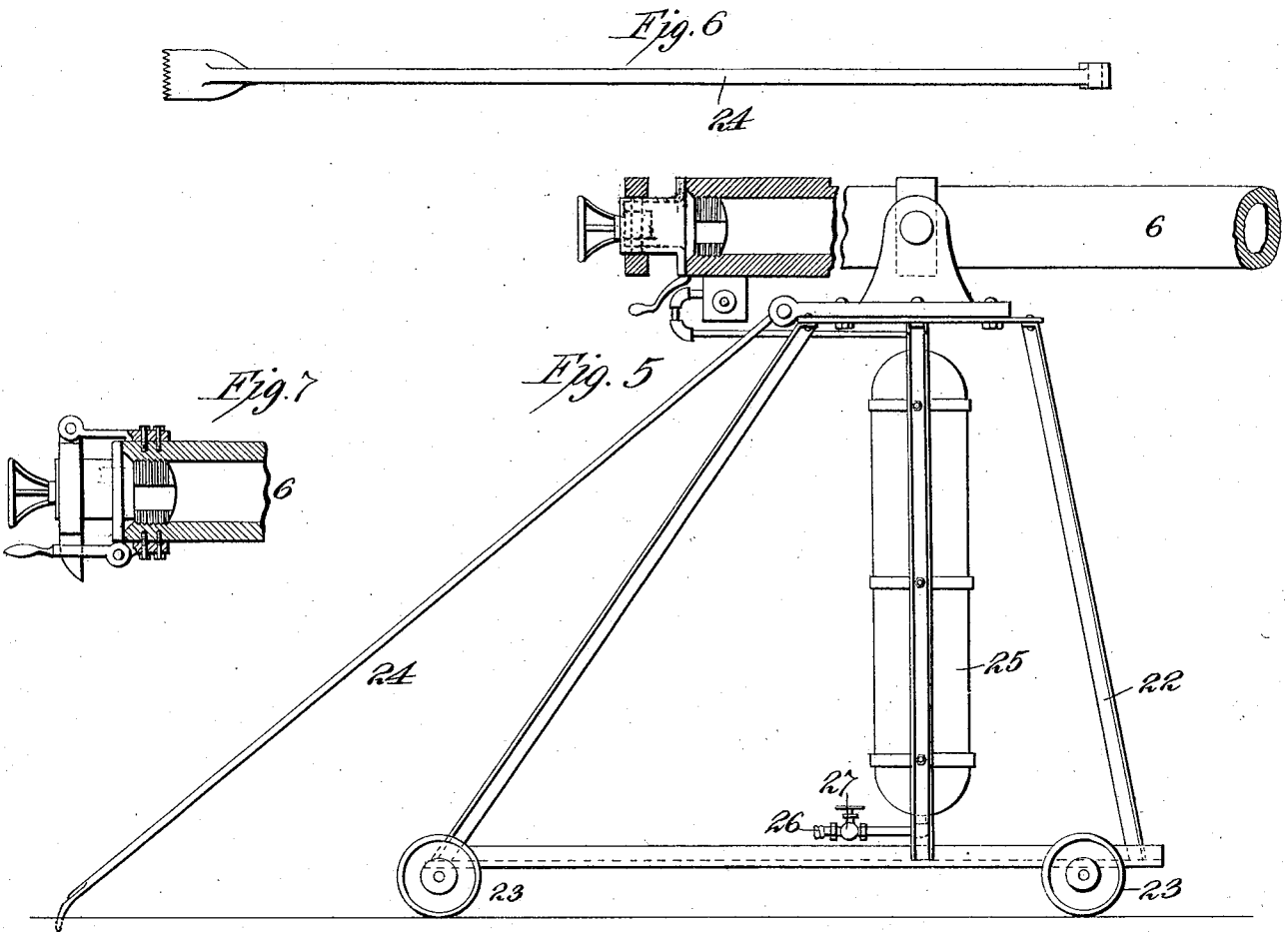
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NO MODEL.

2 SHEETS—SHEET 2.



Witnesses:
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UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

ROTARY CEMENT-KILN.

SPECIFICATION forming part of Letters Patent No. 775,600, dated November 22, 1904.

Application filed July 22, 1903. Serial No. 186,519. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, Orange, in the county of Essex, State of New Jersey, have invented certain Improvements in Rotary Cement-Kilns, (Case No. 1,104,) of which the following is a description.

Prior to my work in connection with the manufacture of Portland cement the Portland-cement mixture has been, and in most cases still is, calcined in rotary kilns about sixty feet in length and heated by means of pulverized coal. As the material progresses slowly through the kiln toward the zone of highest heat it first becomes very viscous; but as the chemical reactions progress it is converted into the usual hard clinker-balls of varying sizes. Although the melting-point of the material in this latter condition is much higher than when the material is introduced into the kiln, yet in the hottest portions of the clinkering zone the clinker-balls become more or less sticky on their surfaces and tend to form into balls or masses of large size. When the material leaves the extremely-hot clinkering zone, it is subjected to a very rapid reduction in temperature, and this chilling of the mass frequently results in the formation of a coherent ring extending completely around the kiln and sticking to the lining thereof, which ring tends to grow in size by accretion of the rapidly-cooling clinker-balls. As soon as one of these rings forms in the kiln between the clinkering zone proper and the lower discharge end the large balls or masses referred to are obstructed in their passage through the kiln, and the latter tends to become clogged up, so as to thereby materially interfere with the proper operation. Consequently the aim has been to break up the aggregates referred to before allowing them to reach an objectionably large size, and this has been usually accomplished by breaking the masses with long steel or iron bars operated by manual labor. This operation has been necessarily slow and expensive, and, owing to the enormous heat, an iron or steel bar will

be softened and rendered worthless in about fifteen seconds, more or less.

With my new cement-kiln I make use of a structure approximately two and one-half times the length of the kilns now used, and in consequence the zone in which the mass forms into aggregates is proportionately removed from the lower end, so as to make it in many cases practically impossible to break up any of such coherent masses by any of the expedients as now employed.

The object of my invention, therefore, is to provide a kiln, or rather attachments thereto, by which any aggregates or masses of material can be effectively broken up, no matter how far their formation may take place from the lower end, and at the same time this operation will be performed much more expeditiously than heretofore and with resulting economies and improvements in uniformity of burning.

To this end the invention consists in combining or making use, in connection with a rotary cement-kiln, of a gun of simple construction operated either by compressed air or steam and by which a suitable projectile may be shot at high velocity into the kiln, so as to hit and break up any masses or aggregates of material therein. Such an operation can be effected very rapidly and without entailing any of the laborious work which is necessary when the operation is performed manually. The projectile employed may be of any suitable sufficiently hard material for the purpose; but it is preferably formed of neat cement molded to the proper shape.

In order that the invention may be better understood, attention is directed to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a sectional view of the rear end of a rotary cement-kiln having a pair of projection-nozzles as proposed by me and showing one form of gun adapted particularly for use with steam as the source of pressure; Fig. 2, a separate sectional view showing the rear portion of the gun; Fig. 3, a section on the

line 3 3 of Fig. 2; Fig. 4, a side elevation of the rear portion of the gun, showing the trigger mechanism; Fig. 5, a side elevation, partly in section, of another and preferred form for use with compressed air; Fig. 6, a separate elevation of the gun-limber for receiving the recoil, and Fig. 7 a horizontal sectional view of the breech mechanism.

In all of the above views corresponding parts are represented by the same reference-numerals.

The kiln 1 is a long rotating tubular furnace lined with fire-brick and opening at its lower end into a stationary chamber 2, into which the burned clinker is discharged. The pulverized fuel is supplied by nozzles 3 3, extending through an opening 4 and manipulated from a platform 5. On this platform I mount the gun, two forms of which are shown. With the form shown in Figs. 1 to 4 the barrel 6 is carried on wheels 7, like an ordinary field-piece, and is provided with a swinging breech-block 8, having a packing 9 and adapted to be locked in a closed position by a cam-latch 10. Cast integrally with the gun-barrel near its rear end is a valve-chamber 11, in which is mounted a plug-valve 12, which is adapted to connect the inlet 13 with the passage 14, leading into the bore. A nipple is formed on the valve-chamber, as shown, and with which a steam-pipe or compressed-air pipe may connect. The shaft 15 of the valve is provided with a lever 16, by which the valve may be moved to its closed position, being then locked by a trigger 17. When the valve is released, a spring 18 moves it to its open position, such movement being limited by a shoulder 19 engaging a stop 20. The projectile 21, formed, preferably, of molded neat cement, is introduced into the gun-bore, and the breech-block 8 is closed. The gun is now aimed at the desired object, and the trigger 17 being released the valve will open and the fluid-pressure will drive the projectile at high velocity against the forming mass, so as to break it up. The valve is then closed, and the gun will be ready for operation when desired.

The form of gun just described is desirable when steam is used as a source of pressure. When, however, compressed air is employed, it is preferable to make use of a storage-reservoir holding enough air for a single shot, as in this way the gun is more portable, since a constant hose connection is not necessary, and it is also more economical, since there will be no waste of pressure even if the valve is allowed to remain open. Such an arrangement is shown in Figs. 5 to 7, inclusive. Here the gun 6 is mounted on a light carriage 22, supported on wheels 23, a limber 24, having a toothed foot, being used to prevent recoil. The breech-block is of the interrupted-thread

type common on naval pieces and needs no description. The valve mechanism may be the same as with the form previously explained. I arrange, however, in advance of the valve a chamber 25, having a hose connection 26 and a cut-off valve 27. With this form a charge of compressed air is introduced into the chamber 25, after which the hose connection may be removed, if desired. When the trigger is released, the compressed air in the tank 25 will shoot the projectile from the gun, as will be understood.

It will of course be understood that any form of gun suitable for the purpose may be used in connection with rotary kilns with the object in view of breaking up any forming aggregates of material, although for practical purposes the very simple forms described are entirely satisfactory. It is desirable that the gun should be operated by steam or compressed air, since both sources of pressure are available; but of course other sources of high pressure may be used, including explosives.

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

1. The combination with a rotary cement-kiln of a gun mounted near the open end thereof, and adapted to throw a projectile into the kiln for the purpose of breaking up any forming aggregates of material, substantially as set forth.
2. The combination with a rotary cement-kiln of a compressed-air gun mounted near the open end thereof, and adapted to throw a projectile into the kiln for the purpose of breaking up any forming aggregates of material, substantially as set forth.
3. In the art of breaking up aggregates or masses of material forming in rotary cement-kilns, the improvement which consists in throwing into contact with the masses or aggregates a compact projectile traveling at a high velocity, substantially as and for the purpose set forth.
4. In the art of breaking up aggregates or masses of material forming in rotary cement-kilns the improvement which consists in throwing into contact with the masses or aggregates a projectile of molded cement, traveling at a high velocity, substantially as and for the purpose set forth.
5. The combination with a rotary cement-kiln and a stationary chamber with which the kiln connects, of a gun mounted behind said chamber, and adapted to throw a projectile through an opening in the wall thereof into the kiln for the purpose of breaking up any aggregates or masses of material forming therein, substantially as set forth.
6. The combination with a rotary cement-kiln, a stationary chamber with which the kiln connects and a fuel-supply nozzle projecting

through an opening in the wall of said chamber for supplying pulverized fuel to the kiln, of a gun mounted behind said chamber and adapted to throw a projectile through said opening into the kiln for the purpose of breaking up any aggregates or masses of material forming therein, substantially as set forth.

This specification signed and witnessed this 20th day of July, 1903.

THOMAS A. EDISON.

Witnesses:

FRANK L. DYER,
WILLIAM A. DOLAN.