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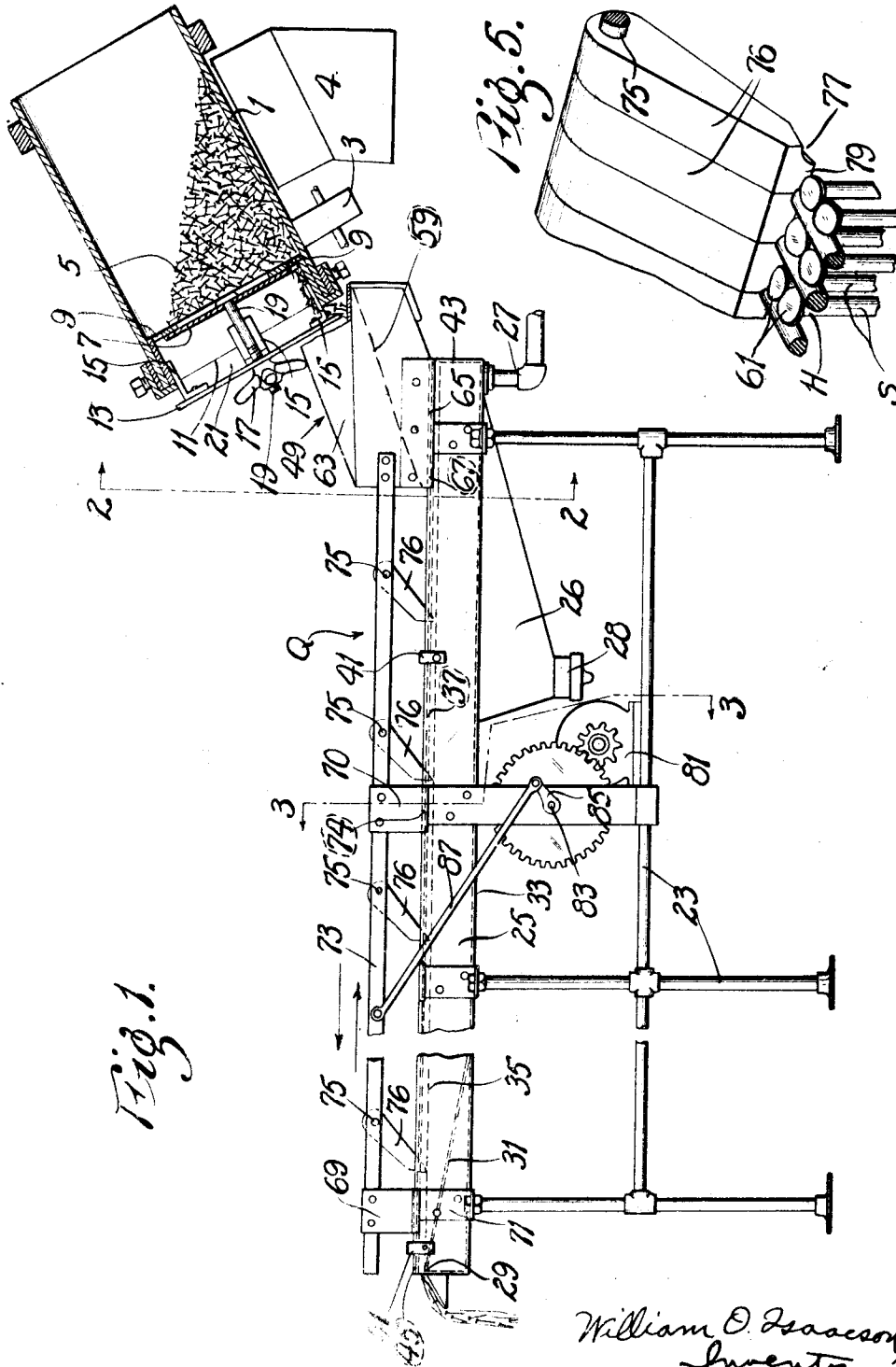
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NAIL

Filed Jan. 31, 1927

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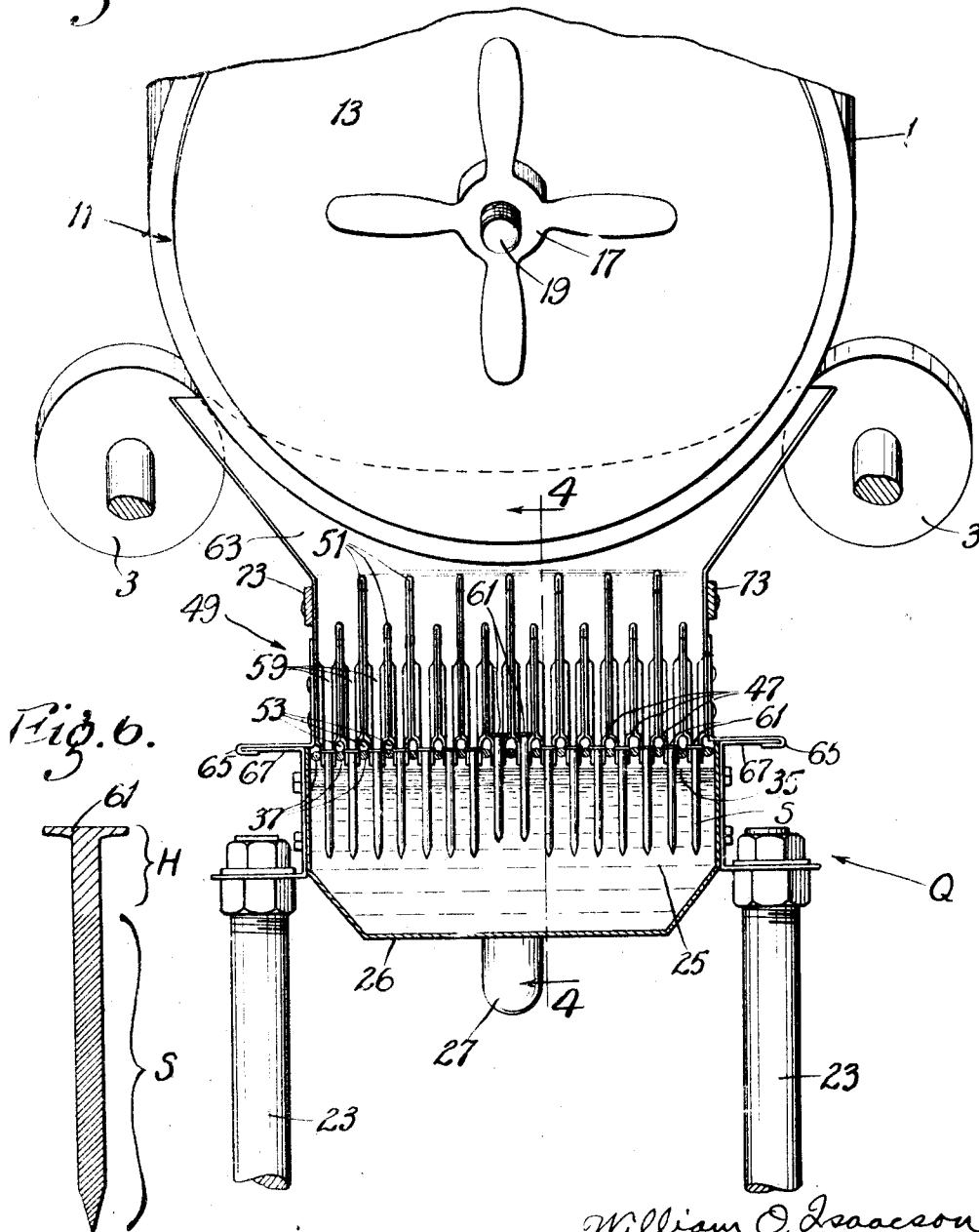
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Filed Jan. 31, 1927

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Fig. 2.



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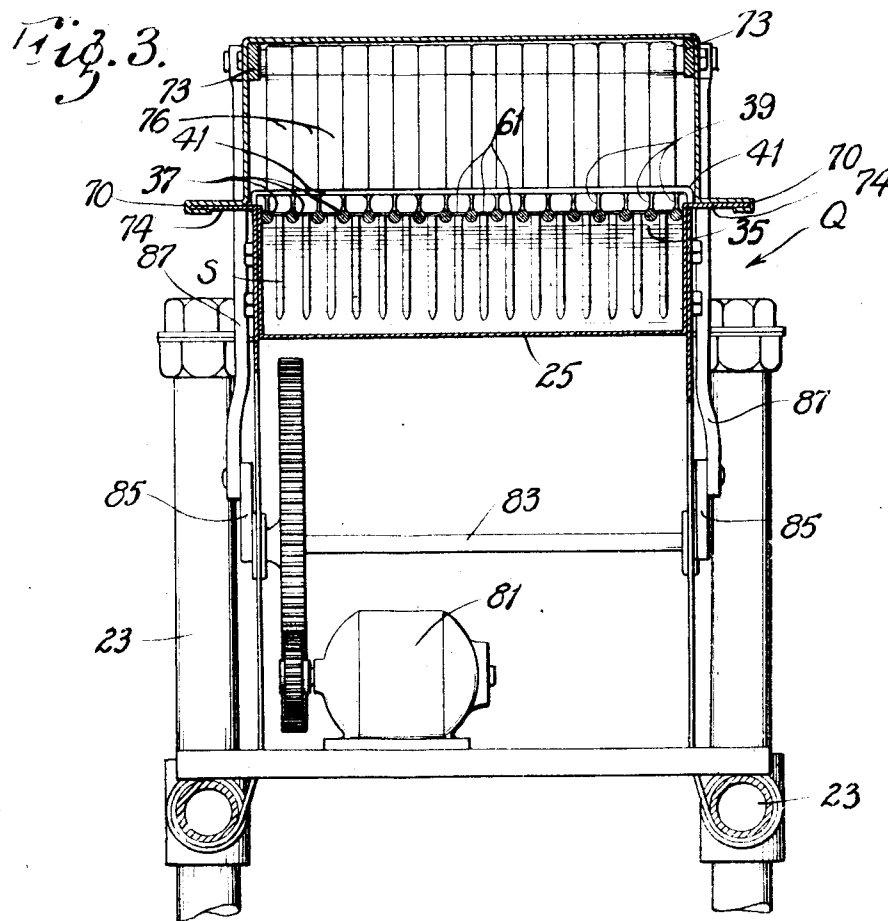
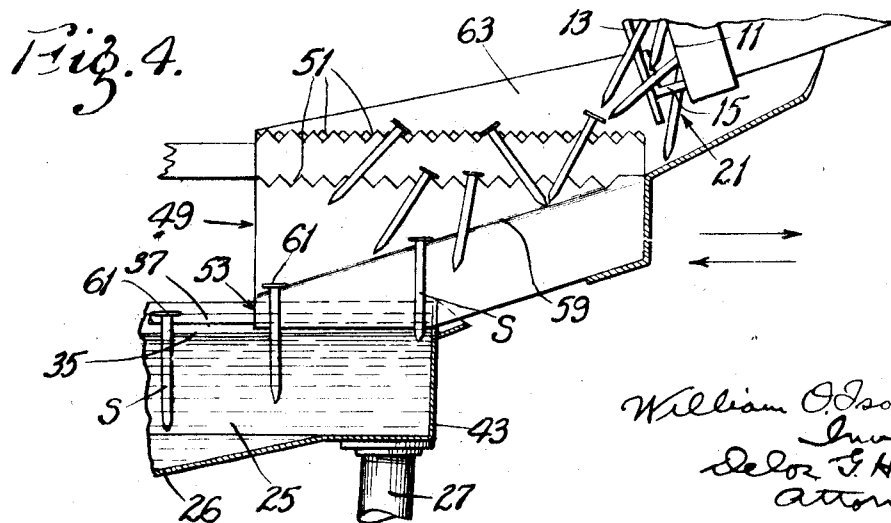
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Filed Jan. 31, 1927

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UNITED STATES PATENT OFFICE.

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Application filed January 31, 1927. Serial No. 164,790.

This invention relates to nails, and with regard to certain more specific features relates to a nail having a hardened shank.

This application is a continuation in part of my co-pending application, Serial No. 51,946, patented February 1, 1927, Patent No. 1,616,426.

Among the several objects of the invention may be noted the provision of a nail having a shank hard enough to penetrate material such as stone or set concrete or the like, yet whose head is preferably malleable enough so as not to chip or disintegrate upon being struck a blow with a hammer or the like. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly comprises the elements and combination of elements, features of construction, and arrangements of parts which will be exemplified in the structure hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings, in which are illustrated a preferred form of nail, and apparatus for treating it.

Fig. 1 is a side elevation of the apparatus, certain parts being shown in section;

Fig. 2 is an enlarged fragmentary cross-section taken on line 2-2 of Fig. 1;

Fig. 3 is an enlarged section taken on line 3-3 of Fig. 1;

Fig. 4 is a longitudinal section taken on line 4-4 of Fig. 2;

Fig. 5 is a fragmentary perspective view of certain feeder dogs; and

Fig. 6 is an enlarged cross-section of the improved nail, showing structural details.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring now more particularly to Fig. 1 there is illustrated at numeral 1 a movable retort which is rotatably mounted on suitable rollers 3. This retort or furnace is adapted to be heated by gas or other means 4 as the retort rotates.

The retort 1 normally carries therein a quantity of nails 5. These nails are formed of more or less malleable material such as cut wire or the like. They may in fact be formed of any malleable material such as may be subjected to hardening by quenching.

The quantity of nails 5 rests against a wall 7 at the lower end of the retort, in

which wall 7 are formed apertures 9 through which said nails 5 sift as the retort rotates. The nails sift through the apertures 9 while said nails are in their heated condition.

Below the lower open mouth 11 of the retort 1 is positioned a closure 13. This closure is maintained in alignment by means of suitable guide legs 15 telescoping the retort and is adapted to be adjusted by means of a hand wheel 17 screwed to a supporting stem 19 held to said wall 7. The purpose of the adjustable closure 13 is to maintain a suitable annular opening 21 at the lower end of the retort 1. As is evident the opening 21 may be adjusted so that a suitable quantity of heated nails will drop therefrom as the retort rotates.

Below the mouth of the retort or furnace 1 is positioned the quenching apparatus Q, hereinafter to be described.

The quenching apparatus Q comprises a supporting framework 23 upon which is mounted a cooling trough or basin 25 of a more or less elongated shape, one end of which is juxtaposed near the lower end of said retort 1. This trough or basin 25 is provided at one end with an inlet 27 for supplying cooling water or oil or analogous fluid. At its other end the basin 25 is provided with an overflow edge 29 from which leads a gradually sloping bottom 31 which joins with the flat bottom 33 of the trough proper. The cool quenching liquid flows into the trough 25 from the inlet 27 and flows out of the trough 25 at the overflow edge 29, whereby a liquid level 35 is maintained in said trough 25.

Located at the upper portion of the trough 25, just above the liquid level 35 are located a plurality of longitudinally arranged wires 37. These wires 37 are suspended in trolley fashion by means of suitable stiff hangers 39 (see Fig. 3). The hangers 39 are joined to suitable cross arms 41 located at desirable intervals and joined to the sides of said trough 25. The wires 37 are of more or less stiff construction and are spaced apart a distance suitable for supporting a nail by its head while the shank thereof depends loosely between two of the wires.

At the right-hand end of the trough 25 the wires 37 are soldered directly to the end 43, while at the left-hand end the wire ends 45 extend a short distance to the end of the trough and thereby form open-ended guides. At said right-hand end of the trough 25,

each wire passes through one forked element 47 of a shaker grid 49. The forked elements 47 are moved relatively to the wires in a manner to be made clear.

5 The shaker grid 49 comprises said plurality of forked elements 47, alternate elements of which have different elevations (see Fig. 2). The upper edges of the alternate elements have notches 51 cut therein in staggered relationship. The purpose of the grid 10 49 is to receive heated nails from the retort 1 and to shake them down and guide them in such a manner that the nails will take suspended positions between the wires 37. The 15 different elevations of alternate elements 47 and the staggered notches 51 result in the nails being caught in position such that they do not tend to remain lying across any two elements (see Fig. 4).

20 The forked portions 53 of the elements 47 not only form passages for the wires as described but also form sloping tracks 59 which support the heads 61 of the nails and permit them to slide down on to the wires 37 (see Fig. 4). The elements 47 are assembled 25 within a hopper shaped portion 63 which is slidably mounted over the trough 25. The slidable mounting comprises slides 65 moving on guides 67 associated with the trough 30 25 (see Fig. 2).

The shaker grid 49, including its hopper 63 is thus movable with respect to the trough 25 and the wires 37. It is joined by means of connecting links 73 to slider members 69 35 operating on guides 71 at the opposite end of the trough 25. The links 73 carry cross pins 75 which in turn rotatably support feeder dogs 76. The dogs on each pin 75 are juxtaposed and extend end-to-end across 40 the trough 25. Each dog 76 is provided at its lower end with sideward notches 77 which are adapted to engage the wires 37. Between each pair of notches 77 is left a tongue 79 adapted to engage behind the nail heads 45 and to push the nails to the left when the pins 75 are reciprocated.

A reciprocating action is given to the framework including the grid 49, the trough 63, the connecting links 73 and the dogs 76 50 by means of a motor drive 81 geared to a jack shaft 83. The shaft 83 carries suitable cranks 85 from which the said system is reciprocated by means of connecting rods 87.

55 The operation of the device is as follows: The motor drive 81 is turned on, whereby the trough 63, grid 49, links 73, pin 75, and dogs 76 are reciprocated. A charge of nails is put into the retort 1 and heated therein as the retort rotates. The mouth 21 of the retort may be closed during the first stage 60 of the heating operation. The nails are brought up to a suitable temperature from which they are adapted to be quenched for hardening purposes. A relatively cool 65 quenching liquid is circulated through the

trough 25 from the inlet 27. Temperatures that have been found satisfactory are about 1550° F. for the initial temperature of the retort; then after inserting a charge of nails, about 1600° for about 45 minutes; then (if 70 carbonizing is desired) about 1600° for about 45 minutes in the presence of a carbonizing medium; then cooling to about 1500°; then the nails are discharged from the retort.

When the nails have been properly heated 75 for the proper time, the cover 13 is retracted so that the opening 21 is formed at the lower end of the retort 1. This permits nails to be dropped on the shaking or reciprocating grid 49. The staggered relationships between the elements 47 and the notches 51 80 cause the nails to positively descend so that they depend by their heads from the sloping guides 59. The hopper 63 ensures that all of the nails enter the grid 49.

85 The shaking or reciprocating action of the grid 49 results in the nails passing down to the wires 37 between which they become suspended by their heads 61, the shanks S, depending from the wires and being positioned 90 in the liquid carried by the trough 25. The positioning of the shanks in said quenching liquid results in the shanks of the nails being hardened by the quenching, while the heads, which are not in the liquid but on the 95 wires are cooled more slowly and therefore become more malleable than the shanks. The shanks are hardened to such a degree that they will penetrate concrete, tile, stone and the like directly. During the cooling, 100 heat flows from the heads to the shanks, thereby cooling the heads faster than would occur in ordinary air cooling. The heads are therefore hardened, but to a less extent 105 than the shanks. The heads are malleable enough that they do not splinter or chip when struck.

After the nails are suspended between the wires in the manner described, they are 110 gradually pushed to the left because of the reciprocating action of the grid 49 in supplying nails to the wires. Each nail pushes the nail ahead of it and the grid forks push the last nail on the wires.

115 The purpose of the dogs 76 is to prevent any one nail from pushing too many nails ahead of it, as this would result in the nails becoming jammed on the wires. As the train of nails reaches the first set of dogs 76, these dogs take up the pushing action and so on 120 for the successive groups of dogs.

By the time the nails reach the sloping portion 31 they are completely cooled, both 125 in the head and shank, the heads having cooled slowly, while the shanks cooled quickly. The portion 31 causes the nail shanks to drag and the head portions to be pushed over the edge 29, where the overflow of quenching fluid is taking place. Suitable means are employed for, disposing and gathering the nails. 130

It will be noted from Fig. 1 that intermediate slides and guides 70 and 74 respectively are provided for supporting the reciprocating members 73. For convenience in cleaning the trough 25 a sump 26 is provided for catching scale or dirt and the like. A cleanout 28 is provided at the lower end of the sump 26.

It is evident that the operation is continuously automatic as long as nails are supplied to the retort 1 and heated therein. After the operation is once started the opening 21 of the retort need not be reclosed when nails are charged in said retort because hot nails are used from the bottom of the retort as those at the upper end are heated.

In Fig. 6 is shown an enlarged section of a preferred form of the nail after treatment. The unthreaded shank S is hard and the head portion H is relatively malleable.

It is to be understood that the movement of the retort 1, taken in combination with the restricted character of the opening 21, results in nails being more or less equally distributed over the width of the shaker grid 49. This equal distribution may be accomplished or enhanced by auxiliary distributing means located between the mouth of the retort 1 and said shaker grid 49.

It is further to be understood that the number of wires 37 used is not limited to the number of forked portions 53 which are employed. If the forks are flared out sidewardly to a greater degree, it is possible to have two or three wires run through each one. This construction permits of the placement of nails between the wires in the manner described and also will take care of any excess nails which may drop over the edge of the shaker grid without their sliding down the guides or tracks 59.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in carrying out the above constructions without de-

parting from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. The nail comprising a cylindrical unthreaded shank, a pointed portion at one end of said shank, said shank and said pointed portion being hardened to such a degree as to penetrate hard material such as set concrete, without bending, a head portion on the other end of said shank, said head portion being malleable whereby breakage is prevented when blows are applied thereto for driving the shank into said material, said head portion being formed integrally with said shank.

2. The one-piece nail comprising a shank having an unthreaded surface, a pointed portion at one end of said shank, said shank and said pointed portion being hardened to such a degree as to penetrate material such as set concrete, without bending, a head portion on the other end of said shank, said head portion being malleable whereby breakage is prevented when blows are applied thereto for driving the shank into said material.

3. The one-piece nail comprising a shank having an unthreaded surface, a point at one end of said shank and a driving head on the other end thereof, said nail being hardened at least at said point and along said shank to such a degree as to penetrate material such as set concrete, without bending the shank when blows are applied thereto.

4. The one-piece nail comprising a shank having an unthreaded surface, a point at one end of said shank and a driving head on the other end thereof, said nail being hardened to such a degree as to penetrate material such as set concrete, without bending the shank when blows are applied thereto.

In testimony whereof, I have signed my name to this specification this 28th day of January, 1927.

WILLIAM O. ISAACSON.