

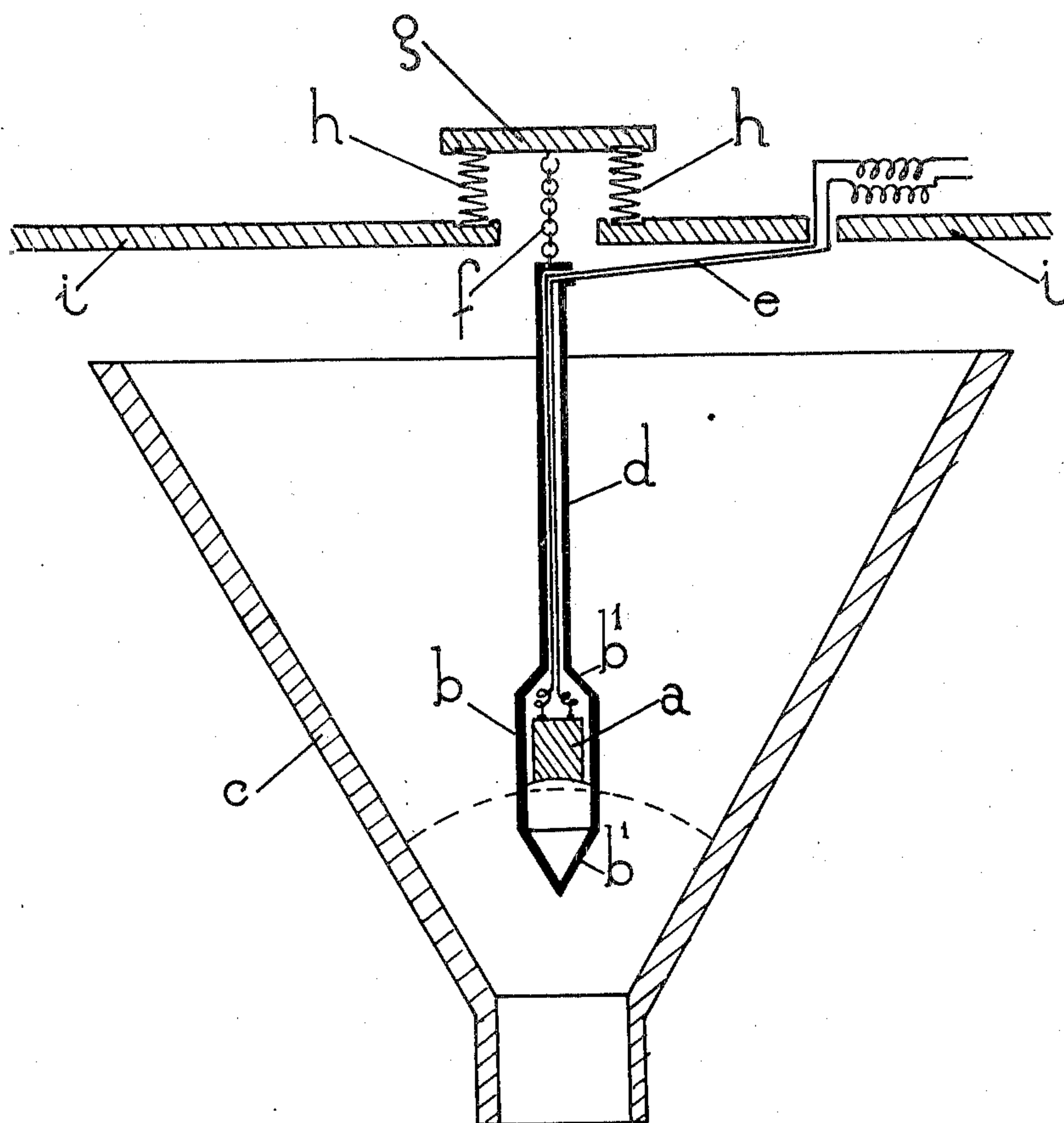
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APPARATUS FOR THE AUTOMATIC UNCLOGGING OF HOPPERS

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## APPARATUS FOR THE AUTOMATIC UNCLOGGING OF HOPPERS

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It is known that the materials stored for industrial purposes in reservoirs or hoppers frequently produce a clogging of these apparatus and this particularly occurs at the beginning of the constricting cone.

When the hoppers are of small dimensions or when the clogging rarely occurs, the unclogging can be effected for example by means of rods introduced by hand.

In the usual cases, it is necessary to make use of a mechanical means preventing such clogging or destroying same as soon as it begins to occur or when it has occurred.

The use of vibration has already provided a particularly advantageous solution of this problem each time it is possible to place a vibrator on the hopper to produce vibrations which are transmitted by the hopper itself to the materials which it contains.

But there are cases in which it is difficult to transmit sufficient vibration to obtain the desired effect, for example when the hoppers are of very large dimensions, when they are very rigidly constructed, when they are made of concrete, etc.

The invention has for its object an apparatus intended to prevent the clogging of hoppers by the use of vibration, but in which the vibrations are directly transmitted to the mass which it is desired to vibrate, without passing through the intermediary of the hopper, and by engaging said mass in the actual region where it is useful to engage same, that is to say at the place where the arch of materials is usually formed.

It suffices in this case to bring a very small power into play to produce the desired effect, the arch of materials being instantaneously broken.

Experience has shown that in the same hopper containing the same material, the clogging almost always occurs at the same place, and that a judiciously designed vibrating apparatus placed at said place absolutely eliminates the phenomenon of clogging.

It is moreover not useful for the vibrator to operate continuously. In fact it is often preferable to operate it intermittently; in that case there is such an insignificant power consumption that it no longer affects the working costs of the plant, and at the same time the efficiency of the apparatus is considerably increased.

The apparatus can be advantageously combined with an automatic starting and stopping switch, for purposes of economy and of greater efficacy.

The increase of efficiency is in that case ob-

tained by the frequent changing of the speed of the vibrator from zero to its maximum speed, that is to say through the whole range of speeds, which implies the necessity of passing through the critical speed which is that at which a resonance phenomenon occurs between the natural vibrations of the vibrator and the period of natural vibration of the whole of the suspended device. At the instant when said resonance phenomenon occurs, the vibration becomes such that the clogging arch is immediately destroyed.

The accompanying drawing shows by way of example an embodiment of the apparatus according to the invention.

As seen in said drawing, the apparatus essentially comprises an electric, pneumatic, or mechanical vibrator *a* which has been assumed to be electric in the example illustrated, fixed inside a cylinder *b*, the two ends of which form conical portions *b*<sup>1</sup>. The upper end of the container *b* can also carry fins or rods to increase the efficiency of the system. Said cylinder *b* can be replaced by a sphere or by any other container of which the shape is suitable for the material to be passed through same.

The cylinder *b* is suspended inside the hopper *c* by a tube *d* or by any other means such as a chain, a cable, a section iron, etc. The suspension member, tube, chain, etc., can be conveniently used to supply the vibrator according to its nature, with the fluid which is to actuate it, air, electric current, or mechanical energy, if it is actuated by a flexible cable, for example.

In the embodiment of Fig. 1, the wires *e* supplying the current pass inside said tube *d*.

The end of the tube *d* is connected by a flexible suspension *f*, such as a ball joint, a chain, etc., to a support *g*, resiliently connected through the instrumentality of resilient shims or springs *h* to two fixed points *i* which may or may not be integral with the hopper *c*.

What I claim and desire to secure by Letters Patent of the United States is:

1. An apparatus for unclogging a hopper, comprising a container, means supporting said container within said hopper in the path of materials passing through said hopper and at a point where the clogging of the materials is likely to occur, a vibrator situated within said container, and resilient supporting means connected with the first mentioned means.

2. An apparatus for unclogging a hopper, comprising a container, means elastically suspending said container within said hopper in the path of



materials passing through said hopper and at a point where the clogging of the material is likely to occur, and a vibrator within said container.

3. An apparatus for unclogging a hopper, comprising a container, means elastically supporting said container within said hopper in the path of materials passing through said hopper and at a
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point where the clogging of the materials is likely to occur, a vibrator situated within said container, and means connected with said vibrator for causing it to vibrate intermittently and with short periods.

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