JAMES DICKEY.

Improvement in Torpedoes for Oil Wells.

No. 120,186. Patented Oct. 24, 1871.

Fig: 4.

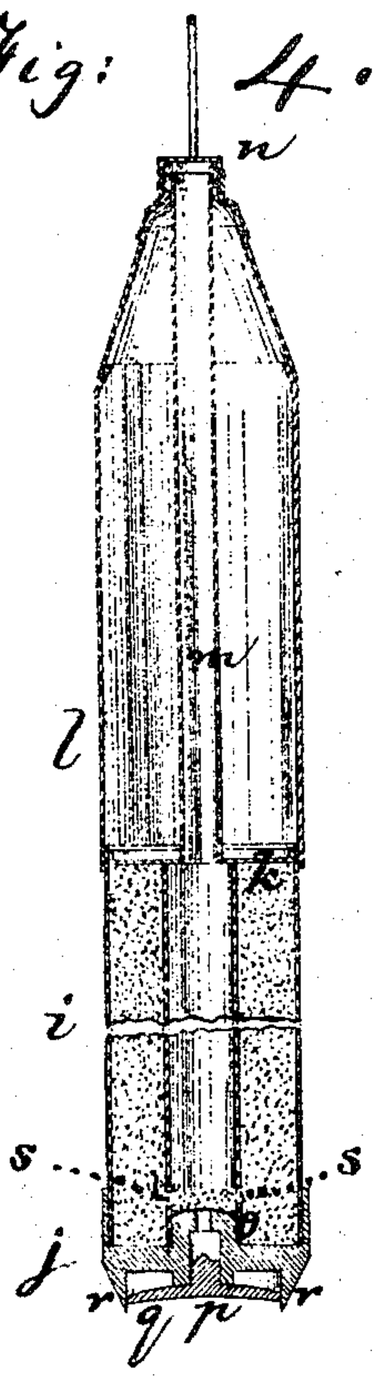


Fig: 1.

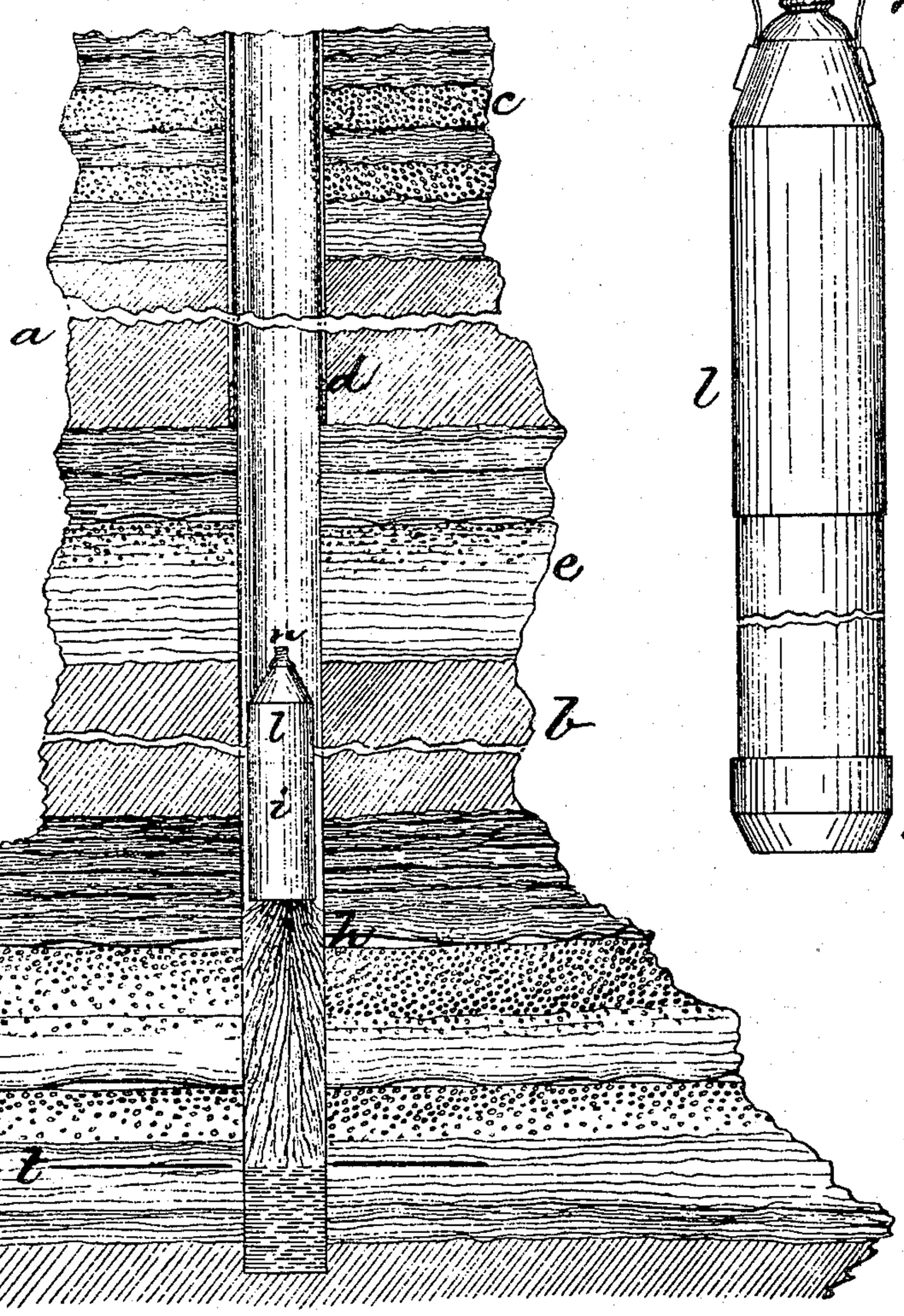
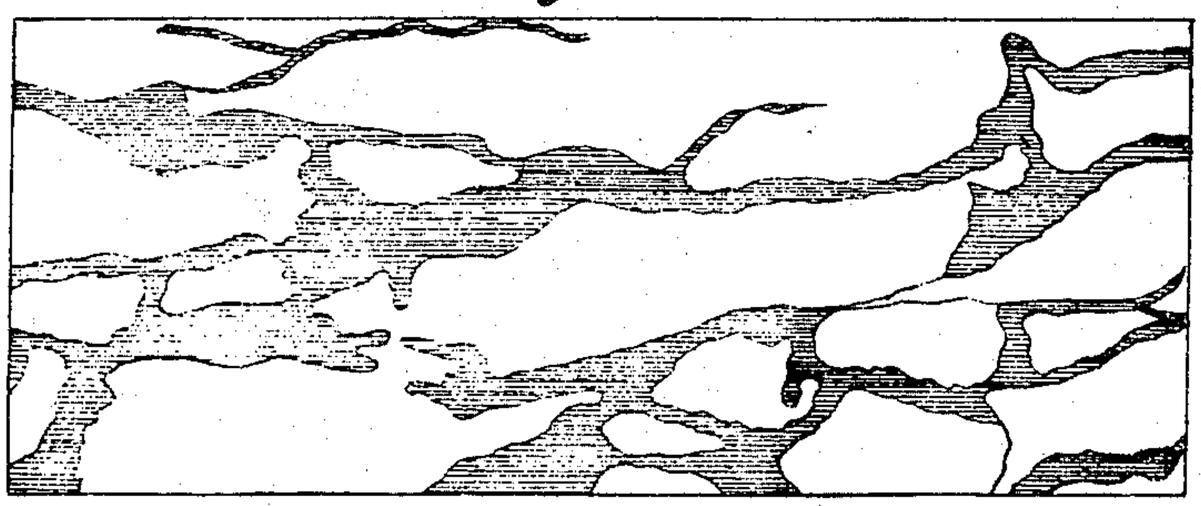


Fig: 3.

Fig: 2.



Witnesses

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UNITED STATES PATENT OFFICE.

JAMES DICKEY, OF OIL CITY, PENNSYLVANIA.

IMPROVEMENT IN PROCESSES OF REMOVING OBSTRUCTIONS IN OIL-WELLS.

Specification forming part of Letters Patent No. 120,186, dated October 24, 1871.

To all whom it may concern:

Be it known that I, JAMES DICKEY, of Oil City, in Venango county and State of Pennsylvania, have invented certain new and useful Improvements in the Process of Removing Obstructions to the Flow of Oil in Oil-Wells, and in apparatus for that purpose; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing making part of this specification, in which—

Figure 1 is a vertical section of an oil-well to exhibit the relations of the several stratums of rock through which it was bored, and the general direction of the oil-bearing fissures or cavities in the rock within the well. Fig. 2 is a horizontal section of the oil-bearing fissures or cavities. Fig. 3 is an elevation of my improved apparatus on a larger scale than the one represented in the well; and Fig. 4, a vertical section of the said apparatus representing the internal structure thereof.

The same letters indicate like parts in the several figures.

Fig. 1 of the accompanying drawing represents the general order in which the several stratums are arranged in the oil-region of Pennsylvania; and as the first and second stratums *a* and *b*, of soap-stone, are generally of great thickness, they are reduced in the drawing by broken lines. The first sand or oil-bearing rock is represented at *c*, and is unimportant, salt water being usually found in the same fissures; and for that and other reasons, that part of the well extending to the lower part of the first soap-stone stratum *a*, is cased by a tube and seed-bag, *d*. The second oil-bearing stratum, *e*, is a coarse sand-stone varying from six to twenty feet in thickness, overlaid with stratified shells and shale rock. And the third or principal oil-bearing stratum, *f*, is a conglomerate of white and yellow pebbles and sand, underlying several layers or stratums, *g*, of shale, the stratum gradually increasing in thickness as they approach the sand or oil-bearing rock. Soft slate is found between the stratum of shale, and generally gas, which is inflammable, and which is usually collected and used as fuel. The sand-rock stratum is from ten to fifty feet in thickness. Between the lower stratum of shale and the stratum of sand-rock are numerous fissures or cavities represented in Figs. 1 and 2 of the drawing, in which the oil is contained, and if the bore of the well passes through any of these fissures, the oil will be discharged into the bore of the well with great force, as it is evidently under heavy pressure. The oil contains a substance known as paraffine, which is deposited in the fissures and against the walls of the well, and so deposited becomes of a wax-like consistency, which, in the course of time, clogs and stops the fissures so that the oil cannot be forced through into the well by the heavy pressure to which it is exposed. In some instances the fissures can be opened and the paraffine removed by the firing of torpedoes; but, in many instances, that method instead of increasing the productiveness of the well, actually stops up the fissures so that the well will no longer supply oil. If the oil-bearing fissures are largest at the bore of the well, as at *h*, and gradually smaller although leading to other fissures, the force of the explosion will drive the paraffine into and completely cork or stop up the smaller part of the fissures. The object of my invention is to so loosen and reduce the paraffine by forcing flame into the fissures, that the internal pressure to which the oil is exposed will force it out of the fissures into the bore of the well, from which it can be readily drawn out. To accomplish this, I make use of an apparatus which I denominate a rocket, and which is represented in the accompanying drawing, in which *i* is a cylindrical case, made of sheet metal, or paper, or other suitable material, with a bottom, *j*, and top, *k*, which case is to be filled with slow-burning powder. The upper end of this case *i* is fitted to another case, *l*, of the same diameter, which is simply to increase the weight and length of the entire apparatus, so that, when dropped into the well, as will be hereinafter described, it will be properly guided. The required weight of the entire apparatus can be obtained by making this part of the case of thick metal, or by filling it with any liquid or granular matter. The upper end of the case *l* I prefer to make conical. Within the compound case *i l* there is a central tube, *m*, extending the whole length, with a suitable removable cap or stopper, *n*, at the upper end. The bottom *j* of the case *i* I prefer to make of cast metal. The upper part has a cylindrical flanch to fit over the case so that it can be slipped on and off, and it

is also formed with a hollow central plug, *o*, which fits into the lower end of the cylindrical tube *m*, and the bore of this plug is of a sufficient capacity to receive a small cartridge with fulminate priming. When the cartridge is fired the flame passes through a touch-hole in the upper end of the plug to the charge of powder in the case *i*. For the purpose of firing the cartridge, a small cylindrical hammer, *p*, is fitted to slide in the cartridge-chamber of the plug *o*, and this hammer is a central projection from a circular disk, *q*, the periphery of which is fitted to slide freely within a cylindrical flanch, *r*, projecting from the bottom *j* of the case *i*. The central tube *m* is to be filled with chlorate of potash or equivalent substance, which will evolve oxygen gas when heated, and the case *i* is to be filled with slow-burning powder—that is, coarse-grained powder—which is introduced through the lower end when the bottom *j* is removed; some of the said charge of powder being placed in the lower end of the central tube *m*, to be ignited by the fire from the cartridge when that is fired; and the fire from the powder at the lower end of the central tube communicates with the charge in the case *i* through lateral holes in the central tube, as represented at *s s*.

The apparatus, charged as above, is applied to oil-wells in the following manner: The liquid is pumped out of the well to some distance below the oil-bearing rock, say to the line *t*, and the apparatus is dropped into the well down which it descends with accelerated velocity, and when it reaches the liquid in the well, the disk *q* striking the liquid forces the hammer *p* against the cartridge, which is thereby fired, and the fire communicated to the charge of powder, the firing of which drives out the bottom *j* of the case, and, by reaction, the case is forced up toward the top of the well in the same manner as a rocket is projected in the air. The heat generated by the firing of the powder acts on the charge of chlorate of potash and evolves oxygen, which unites with the inflammable gases always present in oil-wells, and the heated flame thus produced is forced into all the fissures and cavities of the rock and melts the paraffine, while, at the same time, the force due to the expansion of the gases acts upward on the rock, having an up-heaving tendency. Shortly after the explosion the gases are condensed and a reaction takes place. The oil in the fissures leading to the well, and which in the natural condition are under heavy pressure, due, as is generally believed, to the force of gases in the rock or natural reservoirs of oil, and which, by the force of the explosion and inflaming of the gases in the well was forced back away from the well, on being relieved by the condensation from the pressure induced, which drove it back, reacts, and is in turn forced toward the well, and thereby drives the melted or partially melted paraffine and other deposits out of the fissures into the well, thereby effectually reopening the passages which had been obstructed. This process may also be worked by pumping out the liquid in the well to about the level of the oil-bearing rock, or a little above or below it, and charging the case *i* with faster-burning powder, and with or without the charge of chlorate of potash. When such a rocket is dropped into the well, the explosion of the charge takes place at the instant of striking the surface of the liquid in the well, and the downward force, due to the momentum of the weight of the rocket descending with accelerated velocity, will resist the upward force of the explosion, which will then be mainly exerted downward on the liquid in the well, and laterally against the walls of the well. In this way the rock will be effectually fractured, and the oil in the fissures driven back, as before described, and then when relieved from the force of the explosion, will react by the force which naturally tends to force it toward the well, and more effectually clear out the paraffine and other obstructions than by the mode of using torpedoes, heretofore employed, in which water-tamping is employed; because, with water-tamping, the whole column of liquid in the well is lifted at the same time that the oil in the fissures is forced away from the well by the force of the explosion; and after the explosion, when the oil in the fissures reacts, it is effectually resisted by the action of the tamping column of water as it is falling back to its original level, no such counteracting force being present with my improved process. I prefer to make my improved apparatus of a diameter from one to three inches less than the bore of the well.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The improved process of clearing obstructions in oil-wells by dropping onto the liquid in the well a rocket, which will fire the contained charge on striking the surface of the liquid in the well, thereby using the momentum of the falling apparatus to resist the upward force of the discharge, substantially as and for the purpose set forth.

2. In the apparatus above described, the case for containing the powder, in combination with the movable bottom and the sliding hammer for firing the charge when it strikes the liquid in the well, substantially as and for the purpose specified.

3. The combination of the case for containing the charge of powder with the chamber for containing chlorate of potash or equivalent chemical agent, and the means for firing the charge, substantially as and for the purpose specified.

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Witnesses:
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