Spring Pole Drilling For Water

CABLE-TOOL DRILLING: **(Great for Seeking for Water)**

Cable-tool was the first method used to drill a bore hole and is still in use, particularly for shallow water wells. The cable refers to the manila hemp rope used to suspend the wooden rods and the drilling tools in the earliest operations.

The cable (manila rope or wire line) pulls the string of tools up and down as brought about by a spring pole or a walking beam at the surface. The heavy bit has a blunt chisel end which cracks, chips and smashes the rock by the repeated blows delivered in a measured or regular cadence.

When the objective was brine in the first half of the 1800's, small diameter cable-tool holes could have theoretically been drilled to about 1,000 feet by this spring pole method, but the vast majority of those wells were of much less depth. A handful of potable water wells around the world exceeded 2,000 feet in those early days. They usually took years and great luck to drill that deep. Wells generally ranged from 400 to 550 feet deep, but spring-pole drilling often stopped at about 200 feet and steam power took the wells the rest of the way, if it was available and affordable.

Percussion drilling is another name for cable-tool drilling. It refers to the blows delivered to the rock by the bit.

Man-Power and Horse-Power:

For many of the first oilmen, the matter of drilling on their newly acquired leases depended on money (few had it) and the delivery of a boiler and other apparatus to their remote locations. Under those circumstances it became almost customary to start a well by the driller's leg, or, if fortune had smiled a little, by the use of a horse and treadle.

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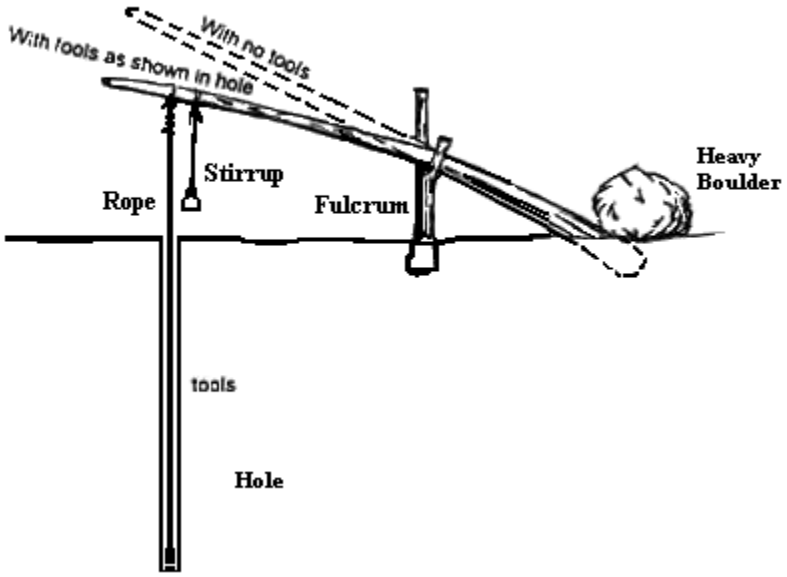
Kicking It Down:



The principle which the spring pole employs is reciprocation. The down-stroke is accomplished by leg power using the stirrup. The pole then springs back (reciprocates) to its normal position which depends on the weight of the drill string and wood or metal rod.

A lot of wells were started with the spring-pole. This method required strong legs and considerable time. The outfit was simple: a long pole, a weight to anchor the butt end, a fulcrum, stirrup, manila rope, oak or metal rods, and down-hole tools including the percussion bit.

It was easy to get the pole. A tree would be selected to give about 30 feet or less of manageable pole and then cut and barked.

The fulcrum or fork was easy to make too. An oak tree would be found with a good limb and then cut to post size. The fork end would consist of a foot of sturdy trunk and a portion of the limb together forming a V. The post of the fulcrum would be firmly set into the ground and the spring-pole would be placed in the fork. The fulcrum would be positioned about a third (or less) distance from the butt end of the pole.

The pole's butt end would be anchored to the ground by boulders or a heavy log in such a way that the butt wouldn't move when the pole was springing.

Sometimes wooden structures with a lintel and clamps would serve to secure the butt. All of these essential things could be found and fashioned in the forest, practically at the sites of the earliest water wells.

The stirrup would hang from the spring-pole very near to the intended position of the borehole, maybe 3 1/2 feet to 4 feet from the working end of the pole. It could be a piece of manila rope looped at the bottom or it could resemble the stirrup on a saddle. The downward push of the driller's leg in the stirrup would bring the tip of the pole down and allow the bit to smack the rock. Sometimes two stirrups were used so that two men could work together.

The drill string (a vertical series of tools and components) would be fastened about 3 feet from the end of the pole. It would consist of manila rope or oak rods with metal connectors, rope socket, a sinker bar, jars, an auger stem and a bit. Manila rope could entirely replace the oak rods if desired, but the rods continued in common use in America into the 1860's, more or less. The augur stem was a 3 1/2 inch diameter solid iron bar up to 32 feet in length (most were shorter) with the box on the bottom into which the pin of the bit is screwed. The stem gives weight and some rigidity to the down-hole operation. Additional cable tool drilling devices were put into use in the 1860's and later, but most reflected a background dating to the salt well days and to early water wells.

A high tripod of poles was erected over the borehole and pullies (sheaves) were hung from the apex of the tripod. This allowed the pulling of the drill string when tools needed to be changed or when the hole needed to be bailed out. The latter was done by a bailer tool which retrieved the accumulated cuttings and cavings and thus cleaned the hole prior to resumption of percussion (cable-tool) drilling. Later this tripod would become the derrick and constructed in that familiar manner.

http://www.petroleumhistory.org/OilHistory/pages/Cable/kicking.html
http://www.dangerouslaboratories.org/drillhistory.html

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The Drake Well Museum has a spring pole set up in the grounds for the amusement of the visitors. This photo shows the working end of the pole. Gerald English demonstrates how to kick it down. One day the author noticed that the well had reached a total depth of about 3 feet probably achieved by school children who arrive in bus loads to see the Museum. Later, workers demonstrated how a bailer works by hooking up the tool and retrieving the cuttings (and some gravel that fell in), thus cleaning out the hole.

Treadles and Teeter-Totters:

Different arrangements to provide the down-stroke were tried out in the early days before steam power became common as a prime-mover. The bit had to forcibly hit the rock. Leg power on a spring pole was only as reliable as the strength and endurance of the man. Therefore, devices to replace sore legs were put into use, but most of these look rather pathetic although they worked and even became rather elaborate by the 1870's, especially the horse-powered machines.

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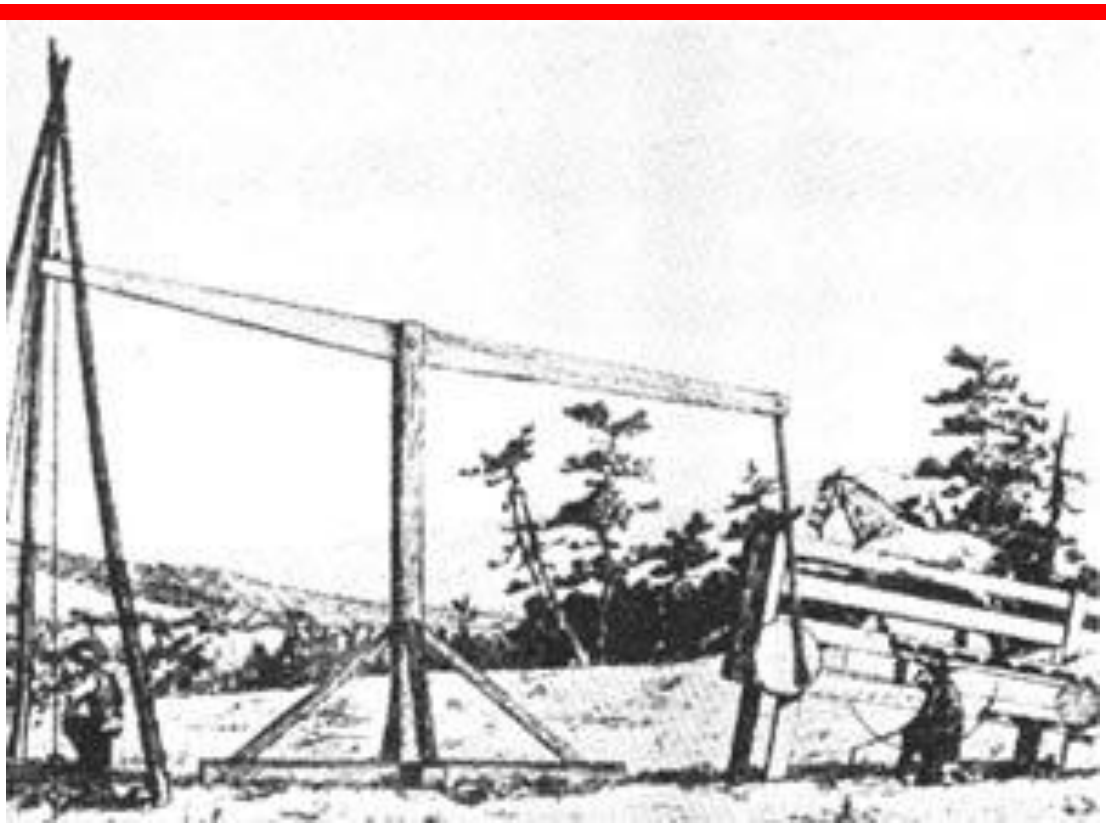

A walking horse, doomed to spend its shift trodding but going nowhere, provided power. The treadmill ran like an exercise machine. A horse and treadle arrangement served to operate a walking beam rig and could have done the same with a spring-pole. It was a matter of hooking it up right. This means of drilling goes back to the salt days and, after a fashion, even before then.

This horse-powered treadle is rigged to a wooden walking beam rather than a spring pole. This arrangement was in use in the early salt days and also served for drilling shallow water wells. This cable tool rig is considered portable. Ca. 1810.

In 1872, a more sophisticated cable-tool device called a horse-driven spudder rig was patented. It used a horse on a treadle but didn't require a spring-pole or permanent walking beam and was considered to be portable. The horse activated a heavy fly wheel, cam, pendulum bar, elbow lever and other apparatus which combined to pull the drilling tools and then allowed them to drop to the bottom.

A type of foot treadle used in early oil drilling provided the means to spool hoisted cable on a drum shaft. The device could be called treadle rim bull wheels. Each wooden wheel (one on either side of the shaft) consisted of two rims about ten inches apart.

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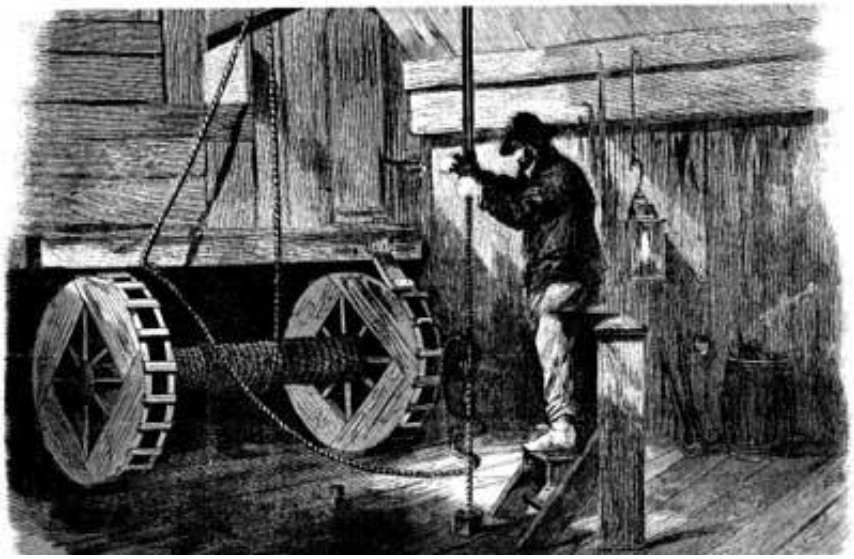
The treadles were rungs of strong wood nailed or screwed to the rims about eight inches apart and were installed entirely around each wheel. This arrangement has been described as a circular ladder (Brantly, 1971). By using his foot on the rungs, the driller could turn the wheels and shaft and thereby wind the manila line or cable on the shaft. He could also control the lowering of the line, especially if a brake device were installed.

The rungs on the pair of bull wheels were foot treadles. The shaft is a spool for the manila rope which has been hoisted or is ready to run in the hole. Note the wooden ratchet brake on the right hand wheel. It could catch on a rung. The spike on the beam near the left wheel helped to keep the rope from tangling. Drake used this type of treadle bull wheels in his 1859 oil well.



One of a pair of treadle rim bull wheels lies in the left foreground in this Mather photo of the 1862 Sherman Well in Oil Creek Valley. The round shaft is clearly visible, but the wheel that would have been on the right end of the shaft is missing. The remaining wheel served as one of two circular treadles operated by foot power and used to take up drilling rope and spool it on the shaft.

In 1861 Andrew Carnegie on his first trip to the oilfields in Oil Creek Valley was fascinated by the strange sights and feverish oil activity there. He wrote vividly about the occasion in his autobiography and thought it fit to mention that he saw two men working their treadles boring for oil upon the banks of the stream. Carnegie, by the way, was a successful oilman, albeit briefly, before he built iron bridges and went on to make steel.

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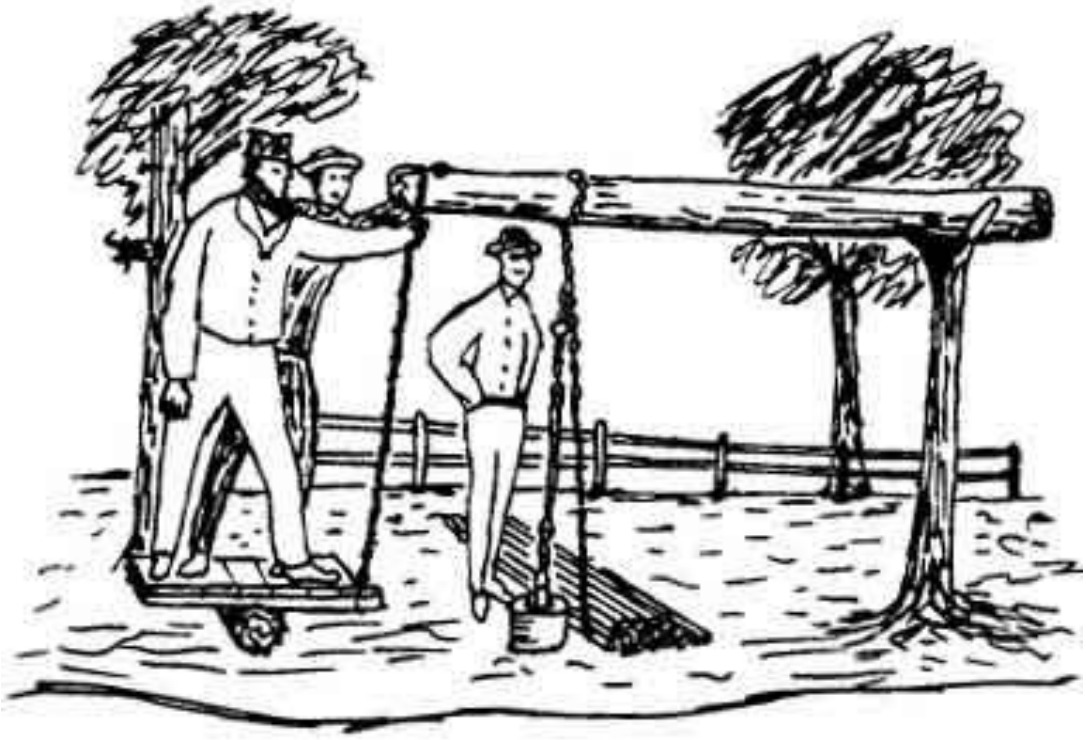
There isn't much information in the literature on the teeter board as a power source. However, since it produced an up and down motion, it must have been able to pull and release the tools. It was tried out with the spring-pole. Brantly (1971) estimates that a teeter board could have worked the drill rods at 60 to 90 strokes per minute, far more than a stirrup-run spring-pole. However, the stroke length was probably quite short.



The anchored butt end of the spring-pole would be off the drawing to the right. The connecting rope for the teeter board in this example is tied at the working end of the spring-pole instead of behind the tool string. Drilling rods are piled on the ground ready for use. The number of them suggest that this well is programmed to eventually reach close to two hundred feet. This drawing is derived from a drawing believed to represent an early 1800's drilling method.

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