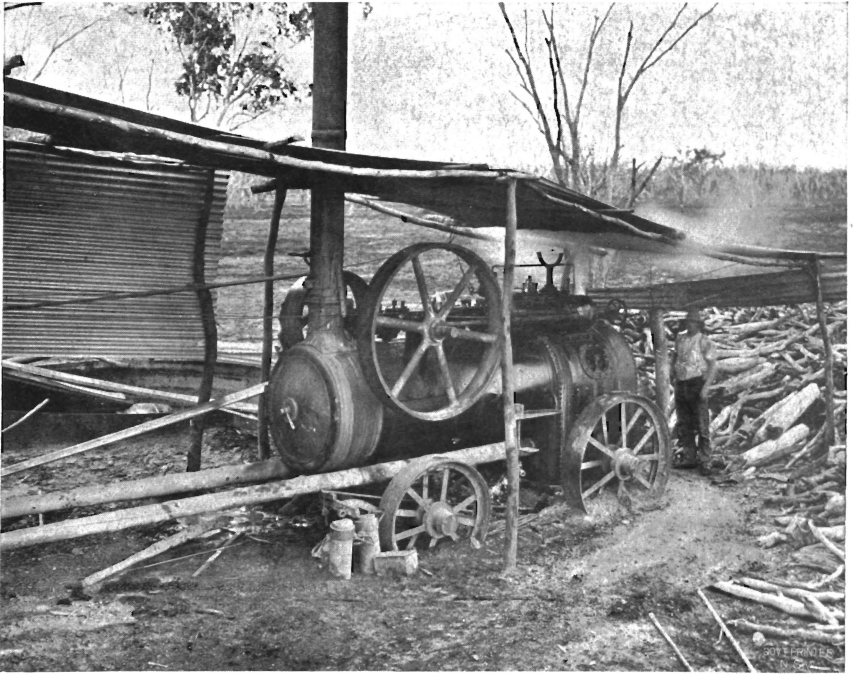


carried on six hardwood foundation piles sunk some 4 feet in the ground ; the six pine derrick floor sills resting on the derrick mud sills carrying the derrick floor of 2 inch planks.

The legs of the derrick are formed each of 9 inch x 3 inch and 6 inch x 3 inch timbers bolted together, whilst the girts or horizontal braces are 6 inch x 1½ inch, and the diagonal braces 5 inch by 1 inch, the whole rigidly bolted together.

The 12-horse-power portable engine with two cylinders 9½ inch diameter and 12-inch stroke, working usually with 80 lb. pressure

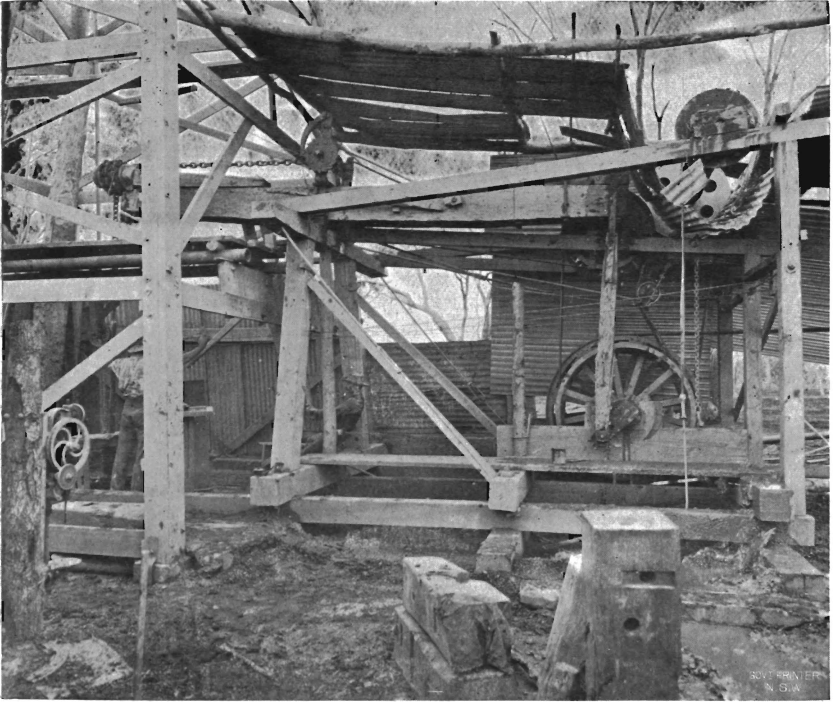


PORTABLE ENGINE—OPERATING PLANT.

for operating the machinery, is provided with heavy fly-wheel and a belt wheel for driving the band wheel on rig ; and is controlled from the derrick by a telegraph cord passing round a telegraph wheel in the derrick, and on the steam-supply pipe.

The traction wheels on engine are firmly embedded in the natural surface, and the engine is strutted off the rig by two round, hardwood distance logs.

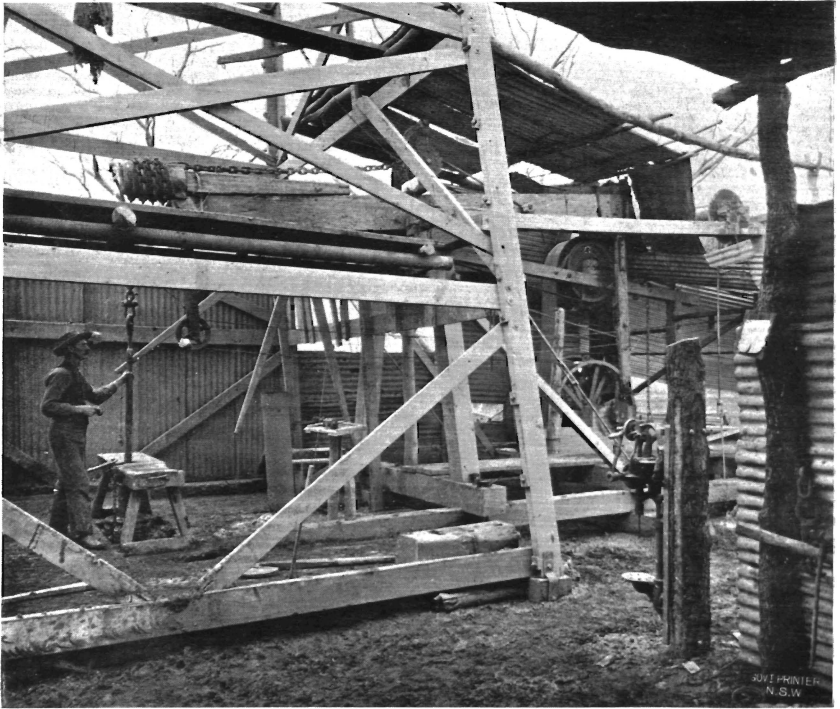
The rig consists of a timber framework carrying a walking beam, with which all drilling is done, and two separate sets of winding gear, one set for operating the mud and sand pump, with which the hole is cleared after drilling, and the other set for handling and placing in position, casing, or long lengths of tools, or heavy weights, and also for fishing.



DRILLING RIG.

The walking beam, 16 inch x 11 inch x 26 feet long, rests on, and is secured to, a wrought-iron pin—on which it works—with two U bolts, the end of the bolts passing through a cap-plate let into top of beam. The bearing-pin is carried in two timber blocks bolted to the framework. The vertical movement of the walking beam, which gives the required drop of the tools, is obtained by connecting the outer end of the beam to the iron wrist-pin bolted to the crank, with a timber connecting rod, called a “pitman,” 4 inches x 9 inches x 12 feet long. The crank is keyed to the main shaft carrying the three band wheels,

the whole being driven by a belt from the engine. The crank is provided with a couple of holes, so that by altering the position of the wrist-pin the stroke of the walking beam can be adjusted. Directly over the centre of the walking beam is secured a "slipper out,"



DRILLING RIG.

round the spindle of which is wound the drill chain. The paying out of this chain is controlled with a ratchet wheel and pawl, the lifting of the pawl allowing the weight of the chain and suspended tools to revolve the spindle and provide the necessary "feed" as drilling proceeds. The drilling chain leads from the "slipper out" and takes two or three turns round a cast-iron "jacket" fastened to the inner end of the walking beam, and thence passes vertically down to the centre of the hole to be drilled.



WINDING GEAR FOR HANDLING MUD PUMP AND HEAVY WORK.

The set of winding gear for operating mud and sand pump consists of a wrought-iron shaft working in two cast-iron plummer blocks, to which is keyed a belt wheel and a long reel, mounted directly over and connected to the belt-wheel on main crank-shaft with a loose belt, so that during drilling operations the belt-wheel on main crank-shaft revolves without engaging the belt. The "sand-line" leads from the reel round a crown sheave at top of derrick. The set of winding gear for handling casing, tools, or other heavy work, is of similar design; the cable, however, after passing over a crown sheave at top of derrick, leads thence through a pair of heavy six-fold iron blocks.

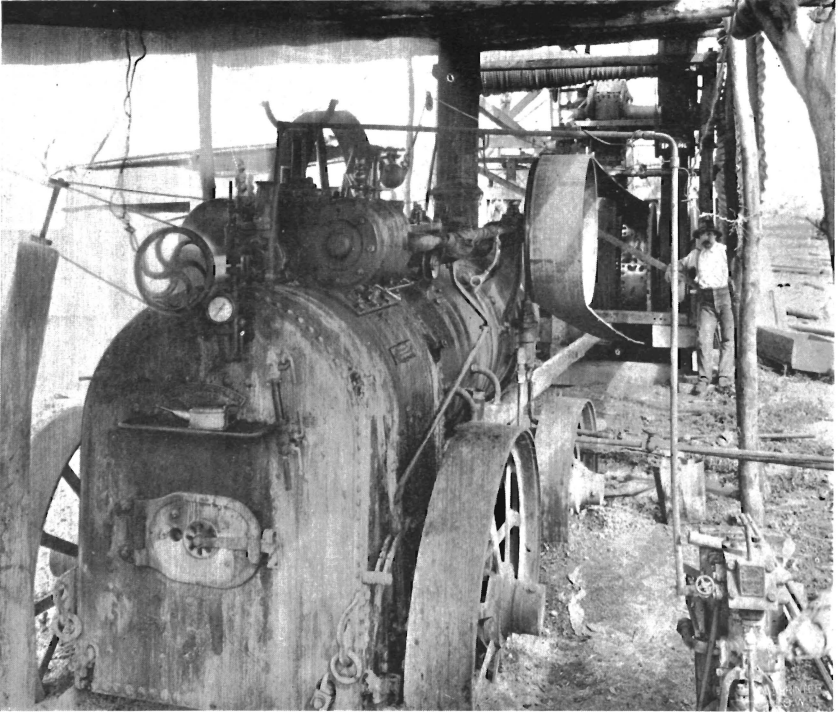
To bring either set of winding gear into use, the "pitman" is disengaged from the crank, and the man in charge then, by means of a lever in the derrick connected with a long rod, pulls into engagement with the previously loose belt, a spool, carried on a swinging bracket, pivoted on a wrought-iron shaft working in plummer blocks bolted to the framework of rig. The engagement of the spool with the belt, tightens same, and imparts motion from the belt-wheel on the main crank-shaft (driven by the engine) to the belt-wheel on reel-shaft. A

second lever actuates the brake-rod, connected to brake strap on the side of the belt-wheel on reel-shaft.

From the foregoing it will be seen how completely the driller has all motions under his immediate and individual control, a matter of first consideration in safe and economical drilling.

DRILLING, CLEANING-OUT, AND CASING.

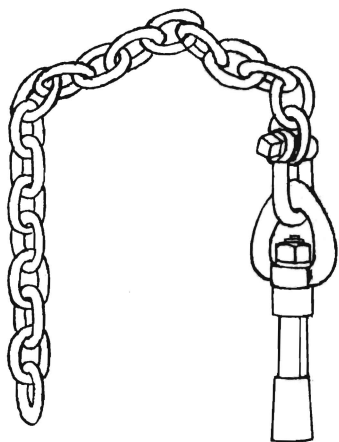
The first operation in connection with the actual sinking of a bore, is to excavate a hole directly under the plumb-line of the chain suspended from the jacket on inner end of walking beam, to such a depth as will



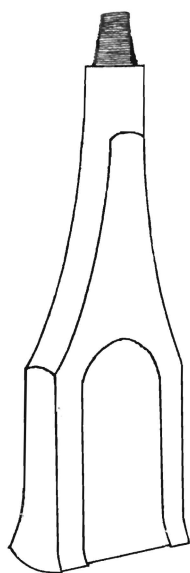
BELT-DRIVE, SPOOLS, REELS AND BRAKES.

give the necessary height below the walking beam for the working of the tools, consisting of drill chain and swivel, short length pole, jars, and spudding bit, drilling a hole 12 inches in diameter. Everything now being in readiness, drilling by percussion is commenced, the walking beam lifting and dropping the string of tools, usually 24 inches. If, however, a rigid set of tools were to be dropped this height, the concussion would soon part same, and it is the function of the jars to prevent this occurring, as well as to prevent the bit becoming fast in the

Drill chain & Swivel, Poles, Jars, & Spudding Bit.



Drill Chain & Swivel



Spudding Bit



Short Pole

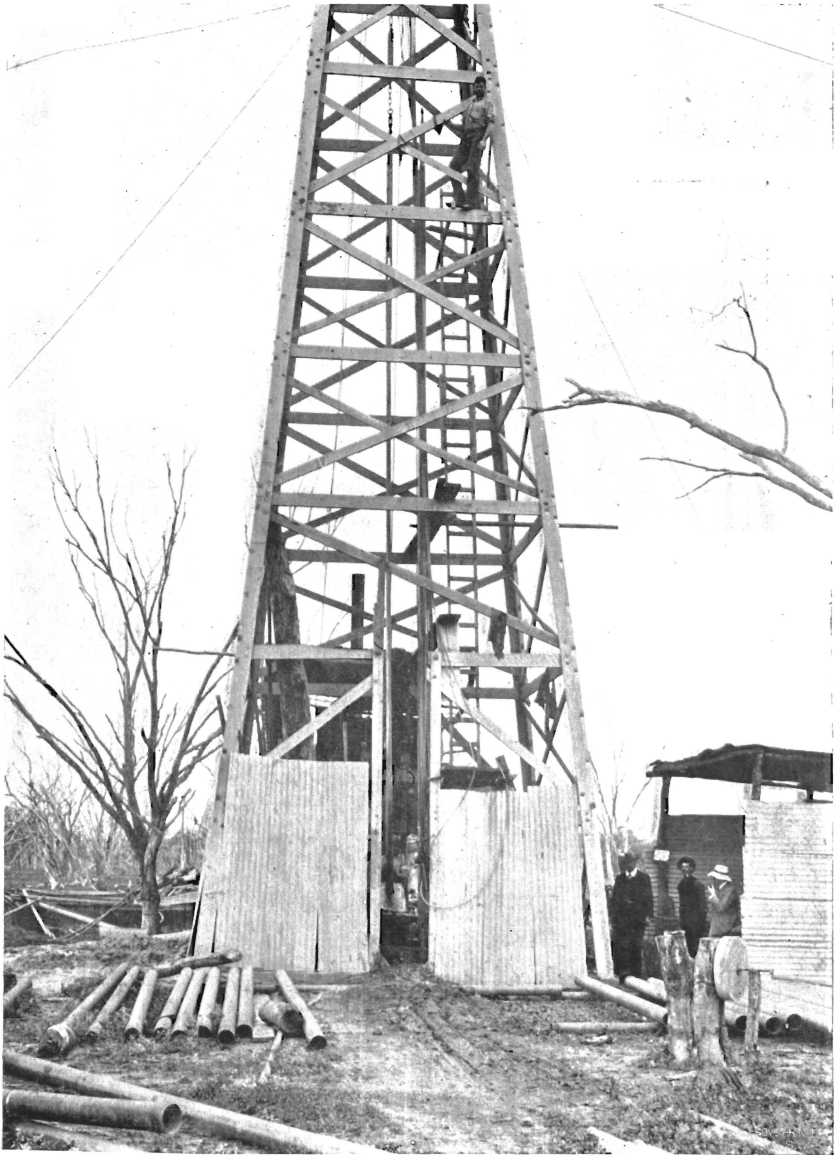


Long Pole
(Spliced)



Jars

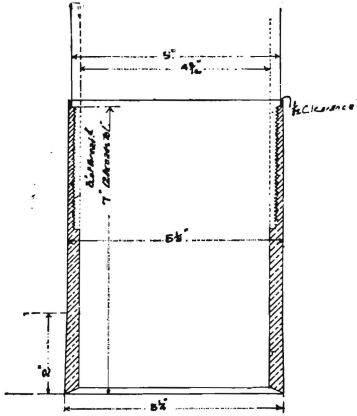
mud or in the crevices of the rock, or a newly-dressed bit from wedging in the bottom of the hole. The play in the jars reduces the actual stroke of the bit from 1 to 3 inches dependent on the hardness of the



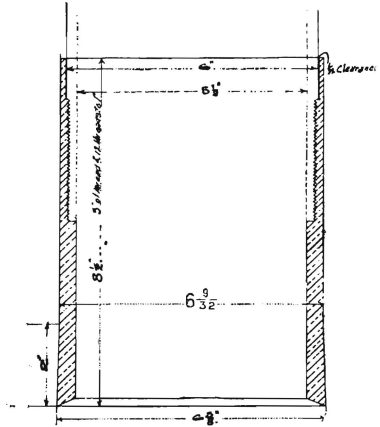
MUD PUMP AND STRING OF TOOLS.

formation. With each stroke (at the rate of from 50 to 60 down to a depth of about 700 feet, and below this depth at from 35 to 40 per minute) the tools are revolved ; whilst, as the drilling proceeds, the

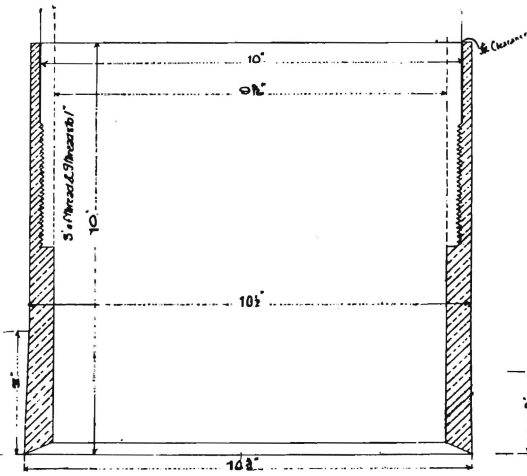
driller, by tripping the pawl of the "slipper-out," provides the necessary feed, about 2 gallons of water per foot drilled being required, until flow is struck, to thin the cuttings, and enable them to be lifted with the mud-pump. After drilling some 5 feet the pitman is disengaged from the walking beam, the drilling chain unshackled from the tools, and the



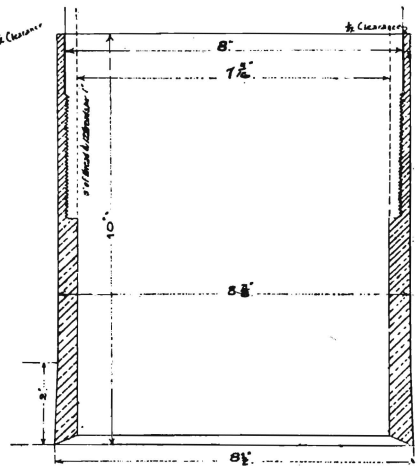
Shoe for 5" Casing



Shoe for 6" Casing



Shoe for 10" Casing



Shoe for 8" Casing

CASING SHOES.

tools removed from the hole with the hoisting cable. The hole is then cleaned out with the mud-pump, drilling and cleaning hole is then continued to such a depth as the hole will stand up at, when swelled joint casing, 10 inch outside diameter, $\frac{1}{8}$ inch thick, weighing 35 lb. per

foot run, provided with a forged-steel shoe screwed on to bottom and riveted thereto, is inserted in the hole. The casing is either forced



TOOLS.

17. Jars. 18. Knock Wrench. 19. 8 in. Casing Swivel. 20. Catch Wrench. 21. 5 in. Casing Shoe.
 22. Tool Wrench. 23. 10 in. Casing Cap. 24. 6 in. Casing Swivel. 25. 8 in. Casing Shoe.
 26. Strap Irons for pole splice. 27. Short Hand Pole. 28. Tool Wrench.

down with jacks, or a solid steel cap is screwed to top of casing, and by means of a heavy hardwood monkey falling some 20 feet is driven down.