hour. In some of the wells the water has 280 grains of salt in solution, and the incrustation is considerable, but altogether the wells have been a success, and it is said the cost of running water trains since the wells have displaced them would have paid for the wells.

SAW FOR CUTTING BENT TIMBERS.

The machine we illustrate on page 339, was specially designed for Messrs Saumda Bros., ship-builders, London, Eng. The mode of working is as follows:—The log previously lined off on each side to the required shape, is placed on a travelling carriage, which is self acting, and moved past the saw at a rate varying from 18 in. to 4 ft. 6 in. per minute, according to the hardness of the wood and the amount of curve and twist A man is seated on each side, at the hand wheels in front of each column. Each keeps his eyes on the line marked on the wood, and, by turning the hand wheel, raises or lowers his saw pulley, so as to cause the saw to enter or leave the wood exactly in the right place. On each side of the wood, and as close to it as possible, is placed a guide through which the saw passes This is held in a friction ring and the workman by gently lapping the handle can twist the saw to make it easily follow the curved cut. The sketch, which is from the *Engineer*, shows a curved and twisted piece which was cut on all four sides in about 45 minutes.

If a log has to be only cut to a curved form without a twist in it, both lifting screws are coupled together by means of a lever on the right hand side of the machine, so that by turning either hand wheel both saw pulleys rise and fall simultaneously; in the case of a log with one regular twist from end to end, by reversing the lever one saw-pulley rises simultaneously as the other falls.

IMPROVED SCREW BLOCKS.

This apparatus, illustrated in the engravings on page 346 takes as regards the three cardinal qualities of power, safety, and economy, a high place among hoisting machines, numerous and ingenious in many cases as these are. Simplicity in construction and mode of operation are invaluable qualities in all mechanical appliances, and these also are possessed in a high degree by the blocks in question. Their simplicity of structure will be seen at once by a reference to the woodcuts

Various modifications of the apparatus may be employed. Under the first, the block consists of a rope or chain pulley, on the axis of which is fixed a pinion, gearing into an intermediate pinion carried on an arm within the block, which again gears into a circle of internal teeth in the hoisting or load wheel. When the load has been raised, or it is desired to sustain it at any height, there is a loop on the framing of the block into which a link of the chair or the rope may be laid. By another modification a tangent screw is carried upon the axis of the rope or chain pulley, and gears into a worm wheel on the axis of the hoisting or load wheel, the two axes being at right angles or parallel to each other—but it is preferred in practice to construct the worm wheel and load wheel in one piece, for greater simplicity Then, as the pulley is brought round, the hoisting or load wheel is rotated by the action of the tangent screw on the teeth of the worm wheel. Under a third modification, the chain or rope pulley is carried upon a trundle, preferably with four teeth, which are arranged in pairs at right angles to each other, and gear into the teeth of a wheel carrying the hoisting or load wheel There is thus obtained a continuous lock of the pulley, one of the teeth of the wheel on the hoisting or load shaft being at all times situated between one pair of the trundle teeth or pins. By a fourth modification of the apparatus, the pulley is fixed on the hoisting or load shaft, the hoisting apparatus itself consisting of an arrangement of pins placed in a slight degree eccentric to the axis of the shaft, and over which the hoisting chain passes. Lastly, under a fifth modification, an eccentric is placed on the shaft of this chain or rope pulley, over which two or more straps are placed, each being provided with an arm which passes through guides near its outer end. These arms extend across the block, and by the rotating action of the eccentric are alternately brought to act on an internal set of teeth formed in the hoisting wheel. By the action of the eccentric these arms are caused not only to enter between the teeth of the wheel, but their outer ends passing through the guides move simultaneously as through an arc, and so rotate the hoisting or load-wheel; and as one or other of these arms is always in gear with the teeth of the hoisting or load wheel, a continuous lock of the block is obtained.

Fig. 1 of the engravings represents a front elevation of the second modification of the improved blocks; and Fig. 2 a side elevation Under this arrangement the framing of the block consists of two straps connected by ties at the top and sides. A chain pulley round which the hand chain passes is situated at one end of the shaft, which rotates on bearings formed in the side ties A tangent screw, formed on the shaft, gears into a worm wheel which is formed on one side of the hoisting or load wheel, which in its turn is carried on a shaft supported in bearings formed in the lower part of the straps, the two shafts being at right angles to each other. Then, as the chain pulley is pulled round by means of the hand chain, the hoisting or load wheel is turned by the action of the tangent screw in the teeth of the worm wheel. The side tie next to the chain pulley is provided with two arms which project outwards and are curved round at their extremities to form loops, which act as guides for the hand chain.

The apparatus may also be used for steering ships, in which case the hoisting or load wheel is fixed on the rudder post, and the rope or chain wheel on the steering shaft. Among the special advantages claimed for the screw blocks are these —That they are perfectly self-sustaining, because, owing to the threads of the screw being constantly in gear with the teeth of the load wheel, but at right angles to the direction of the lift, it is impossible for the load to slip or run down; that they are about thrice the power of any yet invented; that their construction is the extreme of simplicity, hence there is no liability to derangement; and by reason of the maximum of leverage and minimum of friction, an unusually light chain—relatively with the weight to be lifted—can be used; and this chain being of a long-link make avoids the hitherto common occurrence of stretching the links. The blocks have also a double lift, so that only a single length of load chain is required for any height of lift; and they can be suspended from the jib of an ordinary crane, and the hand chain operated by a winch handle, thus forming a valuable machine for heavy hoisting operations. With extensive experiments already made, it has been found that with a two-ton block one man can lift 35 cwt., but with good management 2 tons.

NEW PETROLEUM MOTOR.

A cheap and handy small-power motor for small industries has long been a great desideratum. A motor has recently been constructed at Vienna which seems to promise well to supply this need. Its first application to sewing machines is said to have given such good results as to call forth a large number of orders.

The annexed cut (which we copy from the *Revue de l'Industrie*) will give some idea of this motor.

The principle of the machine is similar to that of a horizontal simple-action steam-engine, with this difference—that the force of explosion of petroleum is substituted for the expansive force of steam.

In the bottom of the cylinder A (which has a double envelope) are three valves The central one, furnished with a very fine sieve, brings into the cylinder the petroleum from a special receiver B The left one admits at the proper moment, the flame C, which is forced, in intermittent fashion, against the orifice by pressure of air.

The petroleum, introduced in a state of extreme division, can thus be inflamed; an explosion ensues, the effect of which is to close the two valves and drive the piston forward. The piston has a hinge joint, by which oscillates a rod connected directly with a crank. The shaft carries, on one side, a transmitting pulley; on the other, a flywheel. A tappet H acts on a bent lever F, which produces at each revolution of the flywheel, pressure on a caoutchouc bellows E. The air inclosed in the latter is carried by a tube D, to the flame of gas or petroleum C, which is elongated for an instant, like that of a blowpipe, and causes the explosion.