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## RADIAL DRILLING MACHINE.

We annex, from *Engineering*, an engraving of a radial drilling machine, the special feature of which consists in the means provided for shifting the radial arm. Usually, in radial drills, the arm is swung round approximately into the position required by pulling or pushing against the end, a worm wheel, however, being in some cases fixed to the lower trunnion on which the arm swings. This latter arrangement is an improvement, but it is open to the objection that in order to operate the worm wheel the driller has to leave his work, and he is thus not able to perfect the adjustment without going backwards and forwards, this of course involving a loss of time.

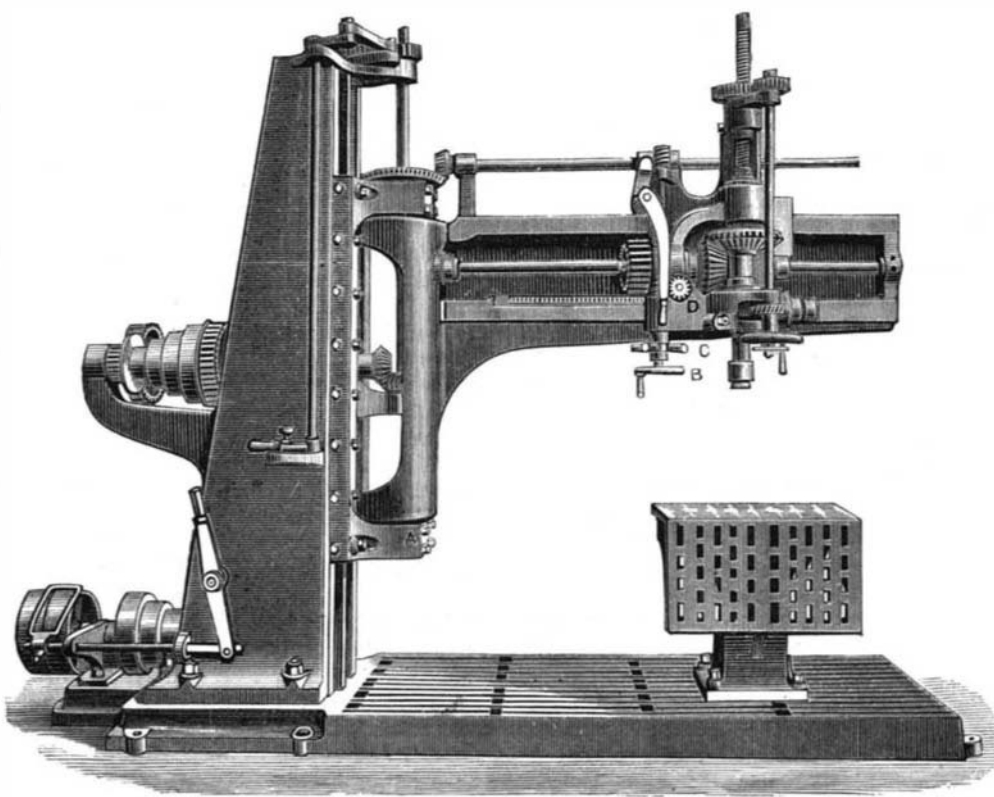
Referring to the engraving it will be seen that the gear for moving the slide on the arm, and also that for swinging the arm itself, is placed under the immediate control of the workman, who can shift either the slide or arm without leaving his work. Thus by turning the handwheel, B, motion is communicated, through the worm gear shown, to the horizontal shaft at the top of the radial arm, this shaft carrying a bevel pinion which gears into a bevel wheel fixed on the frame of the machine concentric with the trunnion of the radial arm. By turning the handwheel, B, the radial arm is thus caused to move round the fixed bevel wheel, and its position can be thereby accurately adjusted. In the earlier machines constructed on this plan a clutch lever was provided, as shown, this lever enabling the worm wheel on the horizontal shaft to be disengaged, and the arm to be thus left free to be pushed round by hand. This provision was made to enable the arm to be quickly moved through large angles.

The cross handles, marked C on the engraving, enable motion to be given to a worm gearing into the worm wheel, D, this being fixed on the same spindle as a pinion gearing into the rack shown. By means of the cross handles, C, the slide carrying the drill spindle can be shifted radially along the arm, and the workman is thus enabled to adjust the drill readily in both directions.

The machine is self-acting by power for raising or lowering the arm, and the extreme radius of the spindle on the arm is 6 feet. The spindle works in conical bearings which are adjustable and keep the spindle always at right angles to the base plate, while the feed screw is provided with a double nut which can be adjusted to take up wear.

## FIRE ENGINE.

The accompanying engraving illustrates a novel en-



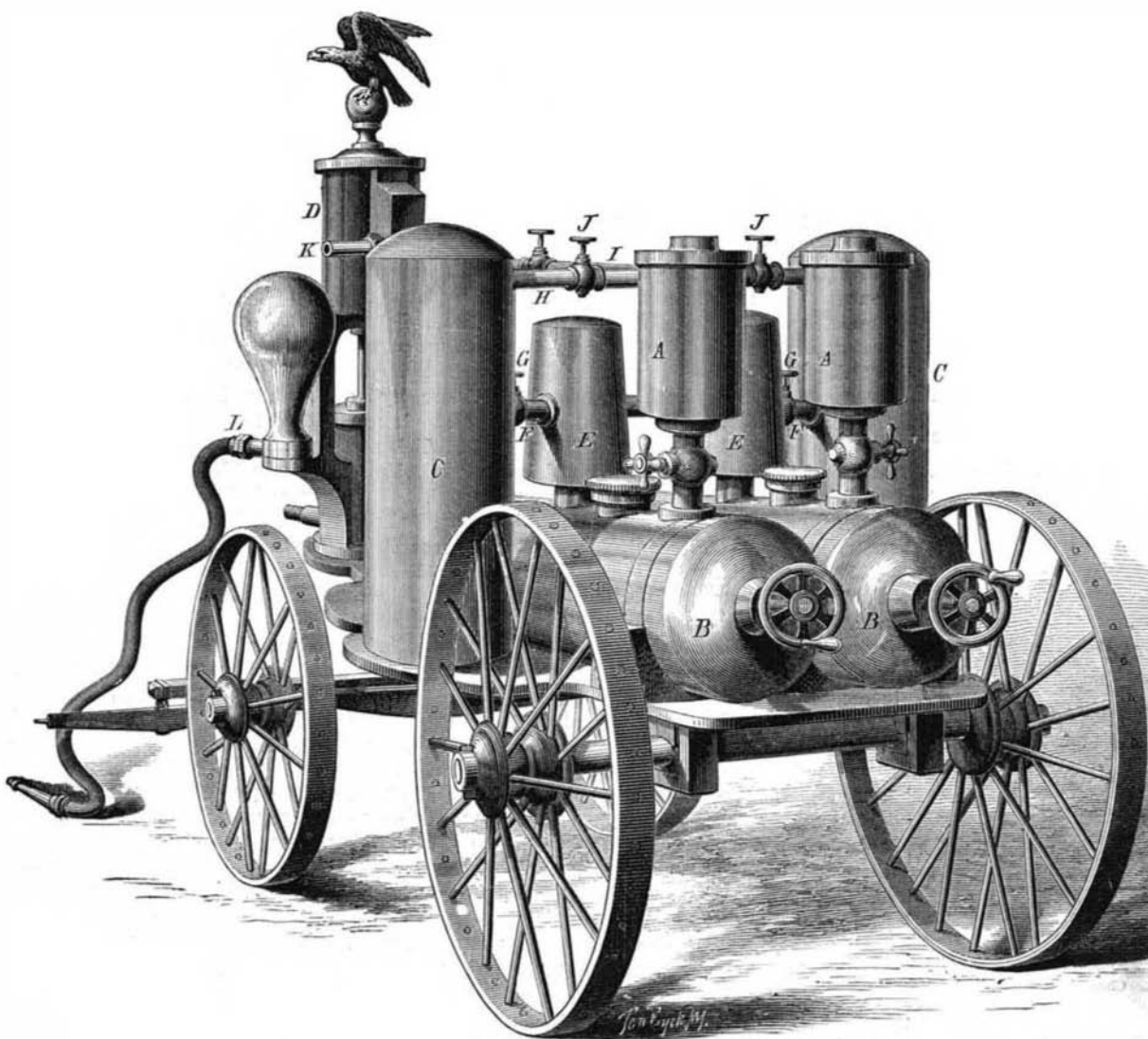
IMPROVED RADIAL DRILLING MACHINE.

gine for extinguishing fires, which consists of a couple of receivers for carbonic acid gas and a pump mounted on wheels and fitted with hose and nozzle, the whole being arranged so that the gas can be employed as a motive agent for the pump; and at the same time, the exhausting gas can be used separately or together with the water for extinguishing fire. In the engraving A represents the chargers; B the gas gen-

erators; C the receivers; and D the pump. The generators are connected by gas chambers, E, and pipes, F, having cocks, G, so that one can be shut off while the other is filling, and the receivers are connected with the pumps by pipes, H and I, having cocks, J, to shut off one while the other is communicative with the pump. K is the exhaust from the steam or gas cylinder, to which a hose and nozzle can be attached for applying the gas to the fire; and L represents connections for the water hose. The gas is to be generated in the usual manner from carbonate of lime (or any of the carbonates) and sulphuric acid, by the use of strong cylinders as receivers, to be filled with this elastic gas to the pressure of 200 to 400 lbs. per square inch, more or less. This gas is to be used to operate the engine and pump, which are of no prescribed form or kind, but are like any efficient steam pump. The water from the pump is to be conducted and applied in the usual way for the extinguishing of flames.

The exhaust of the carbonic acid gas from the engine is conducted in suitable hose, to be used for the extinguishing of flames, as it can be applied in buildings, partitions, under the floors, in cellars, in attics, or in any difficult place of access, and thus confining the fires to the limits in which they originate. It will not freeze at 100° below zero, will be instantaneous in its work, as the cylinders are always to be charged with the gas up to their proper capacity at all times; therefore the engine will always be ready to work at its greatest capacity. As one cylinder is exhausted the generator can be set in operation to replenish it, and thus a steady supply is attained. These cylinders can be made of any number or capacity, as the demand may require. These engines will be lighter, consequently more portable, for manufactories, warehouses, public buildings, and ships. They may be made either stationary or portable in every and all cases, and will be efficacious and instant in their work and operation. The carbonic gas can be conducted into the holds of ships, and, if entirely filled, would do no damage other than extinguishing any active or smoldering fires. The gas is generated, in retorts lined with lead, in quantities, at a trifling cost, from marble dust and sulphuric acid. Though it costs more than steam, yet its efficiency and promptness more than compensate for the extra cost.

Patented through the Scientific American Patent Agency March 14, 1876. For further particulars address Clinton W. Clapp, Wappinger's Falls, N. Y.



CLAPP'S NEW CHEMICAL FIRE ENGINE.