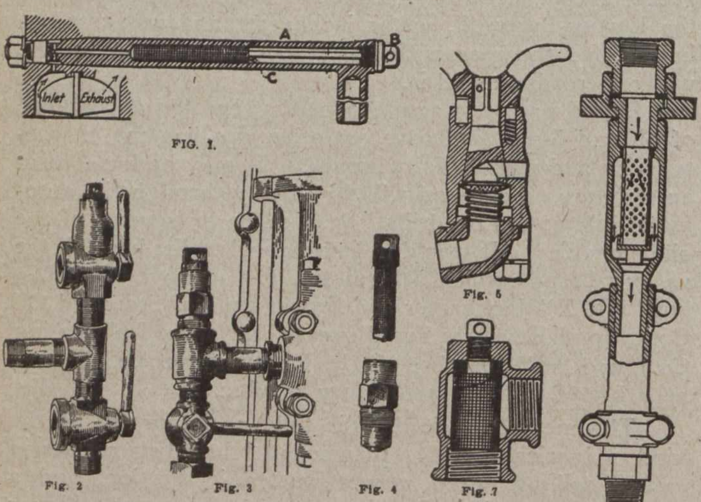
drawing the oil out of the chamber. The porous plug serves the double purpose of regulating the flow of oil and straining out any dirt or grit it may contain. A somewhat similar arrangement is used with jackhamers, but in these drills the oil chamber is placed in the side of the cylinder.

If a drill does not embody an oiling device as an integral part of its construction, it can be fitted easily with a special oiler, of which there are several types on the market. In fact, many modern drills are designed to be used with oilers of the external type.

Fig. 2 shows a satisfactory type of external oiler which embodies an oil reservoir of about a half-pint capacity. It is made of malleable iron with a taper plug valve, and is intended for use with either air or steam-operated piston drills. The reservoir is closed with a screw plug. The taper plug has two cups on opposite sides, each holding about a teaspoonful of oil. One cup is always in communication with the reservoir and filled. A half-turn of the handle empties this cup into the supply passage to the drill, and the oil is carried as a spray into the machine. The other cup is filled ready for another



Rock Drill Lubricating Appliances.

Fig. 1—Handle of a stoping drill used as an oil reservoir. Figs. 2, 3 and 4—External oiler and lubricating cartridge. Figs. 5, 6 and 7—Three types of oil strainers in use with water drills.

turn of the handle. The reservoir holds enough oil for a half-shift's run, and the handle should be thrown about every 5 to 10 ft. of drilling. The right amount of oil is admitted each time, with no loss of oil or pressure.

Another type of oiler, Fig. 3, is designed to take the responsibility for proper drill lubrication out of the hands of the runner and place it entirely in those of the foreman. It operates by the pulsations of air in the supply pipe near the drill, due to the alternating reversals of the drill piston, and from the nature of its operation has been aptly named the "Heart Beat" oiler. It consists of an oiler body containing a plug carrying a cartridge of wire gauze and an absorbent material (Fig. 4). The body is screwed into a tee, to the branch of which the drill is connected, the oiler coming above the tee and the throttle.

The cartridges are carried in boxes. Three cartridges will suffice for one shift. The drill runner going on shift gets three cartridges from the foreman, and coming off shift, he returns three dry cartridges, which are dropped in a tub of oil and recharged. There is no way of drying the cartridges except by using them in the drill, and the return of dry cartridges is proof the drill has been properly oiled. The oil is not wasted—blown out without doing useful work—but is fed slowly and used to best advantage.

The "Heart Beat" oiler not only enforces proper lubrication of the drill, thus reducing its wear and increasing its capacity, but also economizes lubricant. This type of oiler is intended only for use with air-operated piston drills.

Sometimes drill runners introduce oil through the hose, pouring it in before connecting the drill line to the pressure main, thereby saving themselves the trouble of unscrewing the oil plugs of the drill. This practice cannot be condemned too emphatically, for the oil rapidly destroys the rubber lining used in ordinary hose, and furthermore, it carries into the drill any particles of dirt that may have lodged in the hose.

The remaining important point to be considered in connection with lubrication pertains to grit, dirt and other foreign matter. It is scarcely necessary to mention that the working parts of the drill should be cleaned frequently, preferably with kerosene, and kept well oiled or greased while standing idle.

Dirt must be prevented from entering the drill either with the lubricant or with the compressed air. The former point is taken care of by using a good quality of liquid grease only or oil free from impurities and keeping the supply in a closed vessel. A little grit will do a lot of damage in cutting out cylinders, valves and rotation parts. Small particles of grit and dust pass through the hose, and these must be removed before entering the drill, usually, by an air strainer or filter of some type placed as close to the drill inlet as practicable.

Fig. 5 shows the details of a strainer placed within a stoping drill. This strainer consists of a cup-shaped disk of perforated metal held in position back of the throttle valve by a coiled spring. It has been objected by some that a strainer such as this will result in loss of air pressure. However, tests at various pressures have shown that no reduction in air consumption or loss of power occurs through its use. If the work done by the machine falls off, it is an indication that the strainer is clogged with dirt and needs cleaning. It will be noticed that the air inlet is enlarged at the strainer, permitting an unrestricted flow of air.

Fig. 6 shows another type of strainer, which is principally intended for use on stope drills. The straining medium consists of a piece of perforated metal rolled into the form of a tube. The connection of which this type of strainer is a part should always remain attached to the valve chest when the machine is disconnected from the pressure line to prevent dust from entering the tool while lying idle. Dirt collects on the inside of the straining tube and may be easily removed from time to time by taking the device off the drill and blowing air through it from the end opposite that into which air ordinarily enters. Fig. 7 shows a sectional view of an angle filter, which forms a part of the standard equipment of certain water drills.

The straining medium in the filter illustrated in Fig. 7 consists of a tube of brass wire cloth through which the air must pass to enter the machine. The area through this tube is greatly in excess of the area of the inlet and outlet passages, which insures a free flow of air.

The production of graphite in the island of Madagascar, in 1915, amounted to 15,000 tons, compared with 8,000 tons in 1914, 6,319 tons in 1913, and 1,500 tons in 1911. Because of the large demand for this mineral in France and England, the local government has called upon the producers throughout the island to increase their output, and it is believed that the production for 1916 greatly exceeded 20,000 tons.