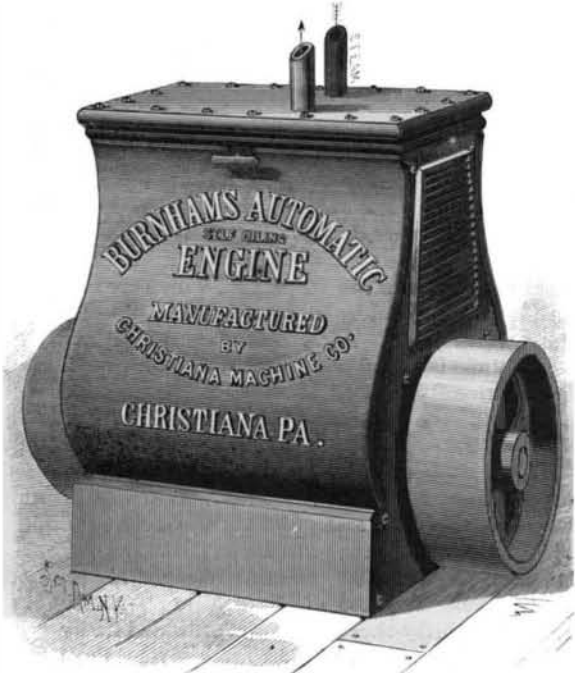


AN IMPROVED AUTOMATIC ENGINE.

The requirements for high speed, smooth working engines have become much more exacting with the increasing use of dynamo electric machines, and engine makers have hence attained a perfection within the past few years, particularly in the making of small engines, which had before been considered hardly worth striving for. Among such improved engines is the Burnham, herewith shown in two illustrations, and which is the subject of three recently issued patents. The inventor, Mr. Nathan F. Burnham, of York, Pa., has here devised an engine which is simple and compact, with comparatively few parts, which is self-oiling, and which can be run at a high rate of speed, while it is economical in the use of steam.

**BURNHAM'S AUTOMATIC ENGINE.—FRONT COVERED.**

The steam cylinder and valve chest, and their connecting pipes, are secured to the cap plate of the supporting frame, and a slotted tubular guide is secured to the end of the steam cylinder to form an axial prolongation thereof, in which works the slide head and connecting rod attached to the crank shaft. The valve cylinder is bored out and the edges of the ports turned; and when the valve is moved up or down to admit steam, the opening around the cylinder is of equal height, preventing side pressure on the valve. The governor consists of a disk keyed on the crank shaft, on which are weights, adjustable ellipse springs, eccentric, and a counterbalance, by which the lead of the valve can be readily adjusted, and the governor will be perfectly balanced when in motion or at rest. The engine is self-lubricating, stationary oil cups or reservoirs being provided at different places filled with oil-saturated wool, from which a loose wick in a tube leads the oil to the parts to be lubricated, as much as desired being supplied, but without waste, while there are collars which prevent the oil from working out, and facilitate its discharge through holes in the bottom of the casing, for use again or removal.

One of these engines was at work in the Novelties Exhibition at Philadelphia last year, driving an Edison dynamo. It was run for twelve hours daily during the six weeks the Exhibition continued, and was awarded a silver medal and diploma. It was a 5 by 5 inch cyl-

inder engine, and was run at a speed of 480 revolutions a minute, and, although the foundation supporting it and the dynamo was only two hemlock joists laid on the ground and floored over, the work was done without any perceptible tremble. Several offers were made for the purchase of this engine while it was on exhibition, at the price now asked for the same size, which were necessarily declined on account of the pendency of the patents, some of the late improvements of which were not then added. Aside from its other advantages, this engine is especially adapted to run in the same room with other machinery without causing damage by steam or vapor. At the works where these engines are made, Christiana, Pa., new tools have been put in for fitting the parts to the best advantage, the crank shaft and all other wrought material, excepting the connecting rod, being made of steel, and all engines are tested before shipment. The general office is at York, Pa.

A Remarkable Diamond.

In August, 1884, the arrival in London of the celebrated 457 carat fine white diamond, from South Africa, and its subsequent purchase by a syndicate of London and Paris diamond merchants, were announced. The gem was intrusted to the care of one of the most skillful cutters, who has been engaged on the stone during the past eight months, and expects to complete the work in April next. As anticipated, the stone will turn out the most wonderful "brilliant cut" diamond on record, surpassing in weight, as also, it is believed, in color, purity, and luster, all the Crown and historical brilliants of the world. The stone, in its almost finished state, weighs still 230 carats, but in order to give it the best possible shape and luster it is intended to reduce its weight to something under 200 carats. The Koh-i-noor weighs only 106 carats, the Regent of France 136¼ carats, Star of the South 125 carats, and the Piggott 82½ carats. The Great Mogul weighs 279 carats. It is, however, a lumpy stone, only rose cut, and if cut to a proper shaped brilliant it would probably not weigh more than 140 carats.

PIPE CUTTING LATHE.

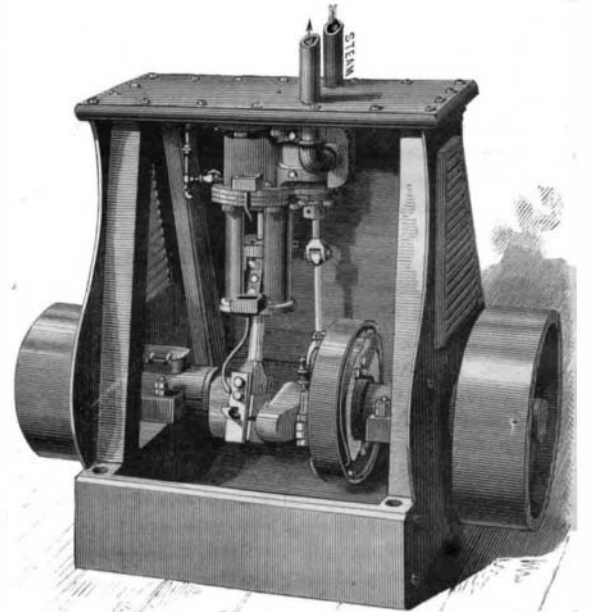
The illustration below represents a lathe for cutting off pipes and for turning them automatically and simultaneously at both ends. The pipes are clamped at each extremity by means of two self-centering chucks. The chucks are mounted within cast iron casings, the bottom parts of which are fitted to slide upon the bed of the lathe, and can be easily shifted by hand, according to the length of pipes, by means of a crank and pinion gearing into a rack. This rack, which serves also for the carriages, is bolted to the one side of the bed for its whole length. Between the cheeks of the bed there is located the driving shaft, with a cone pulley at one end and a pinion at the other end. Two pinions on this shaft, which is grooved on its whole length, engage the toothed surface of the chucks, and travel with them, being held between two collars, which are cast into the casing of the chucks.

The carriages are self-acting for facework and for turning, and travel by means of a pinion on the rack mentioned above. All the necessary gears for the different motions of the carriage are inclosed in a casing cast into the slides, and are operated through a grooved shaft, which runs alongside of the bed, and is geared by a train of wheels to the driving shaft. These lathes are built in different sizes, either self-acting or by hand. The one shown will turn pipes up to 15 feet

long and 8 inches in diameter, and weighs about 4¼ tons.

In order to mount the pipes within the chucks, they are first suspended at their middle portion by means of a rope overhead, and then the chucks may be clamped on the ends, introducing the pipe first into one and moving the other chuck afterward over the other end of the pipe. Where pipes in large quantity and of uniform length have to be manufactured with turned ends, this lathe is very valuable, saving much time and labor.

It remains to be added with regard to the slides of the chucks, says *Engineering*, that these slides, after being shifted by means of the rack and pinion, may be tightly clamped to the slide bars by means of suit-

**BURNHAM'S AUTOMATIC ENGINE.—FRONT REMOVED.**

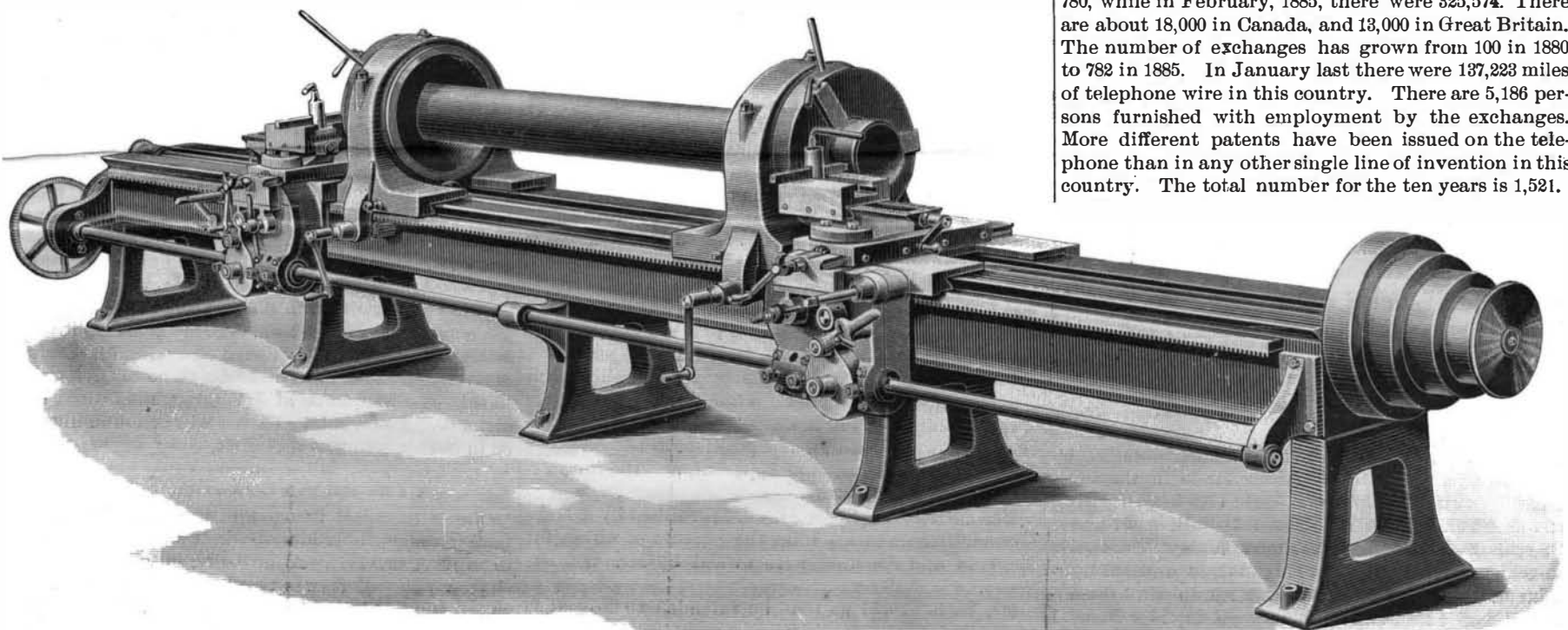
able clamps and screws operated by a wrench, such as shown in the engraving. This tool is manufactured by the Werkzeug und Maschinenfabrik Oerlikon, near Zurich.

A Deadly Tunnel.

The dangers of deficient ventilation have repeatedly been shown in the Mont Cenis tunnel. The ordinary freight train leaving Modane at 9 P.M., the 21st day of December, was observed to come to a standstill at about two miles from the mouth of the tunnel, and did not start again. The conductor of the freight train coming from the opposite direction was informed of the fact, and when coming up to the standing train he found the trainmen on the latter in a dead stupor. They were taken off and transported with all possible speed to Bardonechia, where all of them soon revived. A similar accident happened in the same tunnel only seven weeks before, and both are ascribed to the bad air in the tunnel, which cannot ventilate itself like the St. Gothard tunnel. Luckily, no such accidents have befallen passenger trains, the reason for which may be sought in their more rapid motion.

Growth of the Telephone.

The growth of the telephone is one of the most remarkable in the history of inventions. In August, 1877, the instruments in use in this country was only 780, while in February, 1885, there were 325,574. There are about 18,000 in Canada, and 13,000 in Great Britain. The number of exchanges has grown from 100 in 1880 to 782 in 1885. In January last there were 137,223 miles of telephone wire in this country. There are 5,186 persons furnished with employment by the exchanges. More different patents have been issued on the telephone than in any other single line of invention in this country. The total number for the ten years is 1,521.

**PIPE CUTTING AND TURNING LATHE.**