SECRET SERVICE SWITCHBOARD.

The switchboard illustrated was designed for the Citizens' Telephone Co., Decatur,, Ind., by the Baird Manufacturing Co., of Chicago. It is equipped to take care of fifteen rural lines, each line having a capacity of nineteen telephones, a total of 285 instruments, each of which enjoys the same privacy as an individual subscriber on an individual full



The Baird Secret Service Switchboard.

metallic circuit. The calling apparatus is shown in the upper right-hand corner; this operates the lockout mechanism of the various phones, and are connected into the cord circuits of switchboard in such a manner that one calling device will take care of all the calls an operator can handle with five pairs of cords. The instruments on the line are not connected with the calling device until the operator plugs in, the calling device being connected into the cord circuit, and not the line circuit. Decatur to-day has 130 of these instruments in use, and is equipping its exchange to take care of double the present facilities, which proves that the apparatus has substantial merits.

HIGH-SPEED, AUTOMATIC, VERTICAL STEAM ENGINE.

The newly-dawned twentieth century is witnessing a great conflict of forces between steam, gas and oil as prime movers. Father Time, with the law of the survival of the fittest in one hand and his keen sickle in the other, is cutting down on every hand cumbersome, complex, uneconomical, obsolete types of reciprocating steam engines. The museum is geeting some; the scrap-heap and foundry cupola are receiving more. Only those plants employing the most skilful designers, equipped with the finest modern machinery, using the best material, and hence, putting on the market prime movers which embody the highest conceptions of the science of engineering and the most perfect product of the mechanic's art are holding their own. In this latter class may be ranked high the manufacturers of the neat, compact, efficient, high-speed vertical steam engine, illustrated in Fig. 1:-

These engines are specially designed for the driving of direct-connected generators, pressure blowers, etc. Being of comparatively large cylinder diameter and short stroke, they develop great power and high rotative speed without excessive piston travel. A system of forced lubrication and the complete enclosure of the moving parts provide for continuous operation for weeks at a time, without attention, and ensure perfect reliability, even in the hands of the unskilled. Within the heavy cast-iron base, to which is bolted the lower part of the frame, a submerged oil-pump, operated by the crank-shaft, draws oil from the reservoir, and forces it through pipes and internal passages in the moving parts to the crank-pin, the wrist-pin, and the main bearings. Twice during each revolution the reversal of stress on these parts, due to the double-acting feature of the engine, so reduces the pressure that the pump has an excellent opportunity to force between the surfaces a fresh film of oil, which is carried around to lubricate the rotating

parts when the pressure is greater. The pressure of 10 to 20 pounds per square inch positively maintains this film of oil, preventing actual contact of metal, reducing wear and friction to a minimum, and ensuring a mechanical efficiency of over 90 per cent. Centrifugal oil-guards, located on the shaft just where it passes through the casing, together with the enclosing frame and the water-shed partition, ensure perfect cleanliness, and absolutely prevent the escape of the oil which is a continuously resummed to the hearing.

oil, which is continuously repumped to the bearings. The watershed partition, a valuable and distinctive feature, prevents water from the piston-rod stuffing-box mixing with the lubricating oil in the case, and at the same time makes impossible the passage of oil from the enclosing frame to the interior of the cylinder. The piston-rod stuffing-box may be readily adjusted without opening the case. This watershed partition forms a part of the enclosing frame which protects the parts from dirt and accident,



Fig. I.

ensures economy, and eliminates the necessity of frequent attention; but the removable oil-tight plates or covers make the parts as accessible as in the open type of engine.

The cylinder, with which is cast the valve chamber, is provided with relief valves, which, by opening automatically at any pre-determined pressure, prevent possible damage by water. A planished sheet-iron cylinder casing enclosing a thick layer of asbestos greatly reduces condensation. This lagging need not be disturbed, for the cylinder is tapped