Seth Wilmarth.

Seth Wilmarth, one of the greatest of American machinists, died at his home in Malden, Mass., Nov. 5, aged 76, of heart disease. In navy yard circles, for the past quarter of a century, Mr. Wilmarth occupied a distinguished place, and made many and important mechanical improvements. His advice was sought by the most prominent machinists of the world. Over twenty patents were taken out by him, among them the hydraulic lift for revolving turrets, for which alone the United States Government paid him $50,000. He invented a planer and the great lathe at the Charlestown Navy Yard, at the time of their construction the largest machines of their kind in the world. He was a farmer's son, and was born in Brattleborough, Vt., in 1810. Evincing a predilection for mechanical work, he was apprenticed at a machine shop in Pawtucket, R. I. He rose rapidly until he was recognized as a master of every branch of mechanical knowledge, and in 1855 he was appointed Master Mechanic and Superintendent of the Charlestown Navy Yard by Rear-Admiral Joseph Smith. Every building of importance in the yard was erected under his supervision, and he was the guiding mind in every mechanical improvement projected.

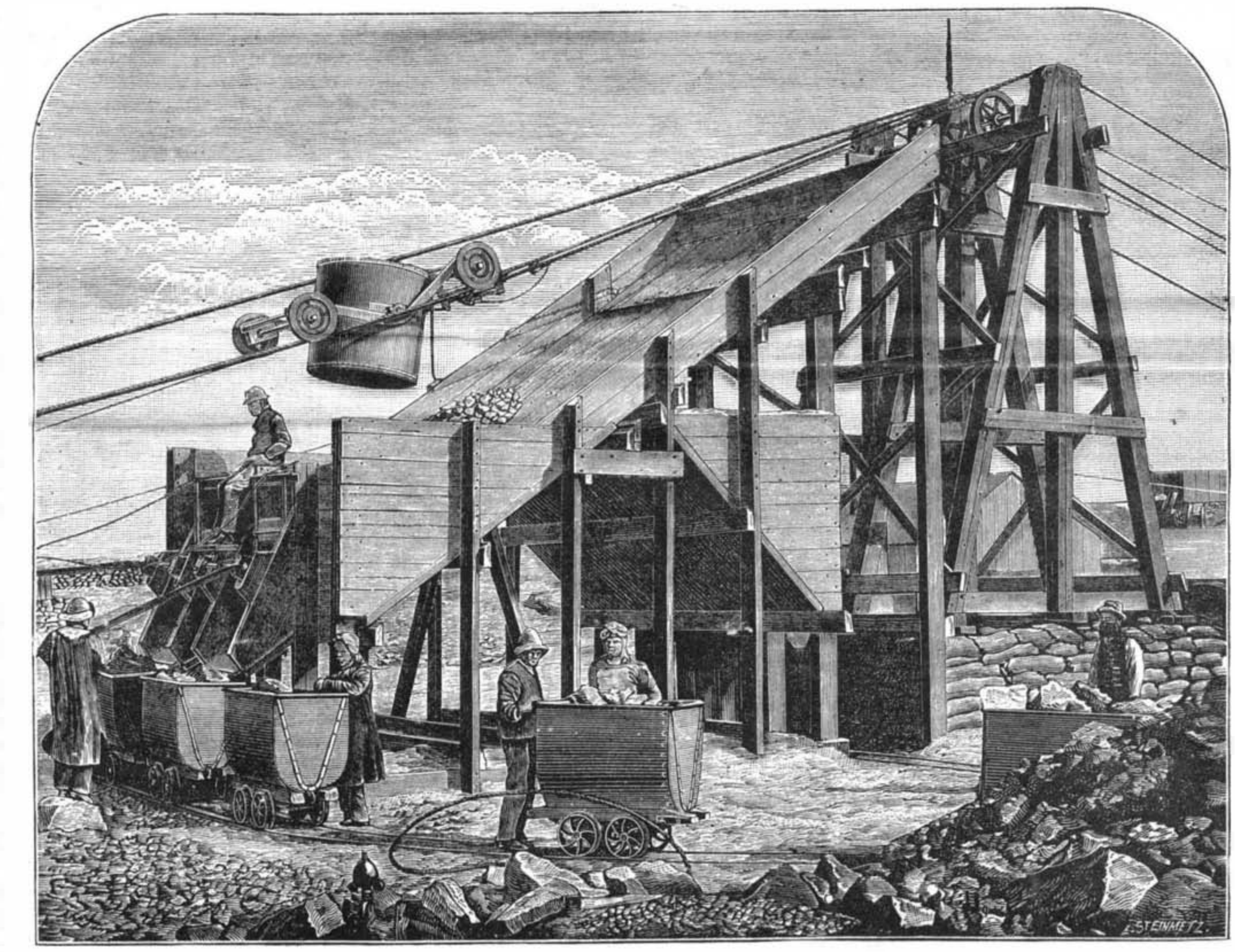
Dangers of Sewer Gas.

The amount of sickness caused by sewer gas, the world over, is little known. Defective plumbing is one form of murder. Death is almost sure to result unless the victim has a strong constitution to withstand the shock he receives from this source. It was defective plumbing, the *American Builder* claims, which caused the late severe illness of Secretary Manning. Workmen engaged in tearing the plumbing out of Secretary Manning's private office found in a little closet in the corner a pipe four inches in diameter, besides several smaller pipes, leading directly to the sewer without any trap or contrivance to prevent sewer gas from coming into the room. These pipes strike the sewer just at its head, where the greatest amount of gas is formed. In the winter, when the doors and windows were shut, the air was most oppressive, and sometimes in the coldest weather Mr. Manning was forced to open the windows. His physicians pronounce his disease blood poison from sewer gas, and say that it was brought on, beyond doubt, by his sitting in that little room.

THE AFRICAN DIAMOND INDUSTRY.

At the diamond mines, South Africa, an immense amount of machinery is now employed in the work of elevating the earth containing the diamonds, crushing and separating the same. The earth is raised from the mine pits by means of tubs that run on wire cables, the loads being carried and dumped on inclined boxes, thence distributed into small cars, to be distributed upon the depositing floors.

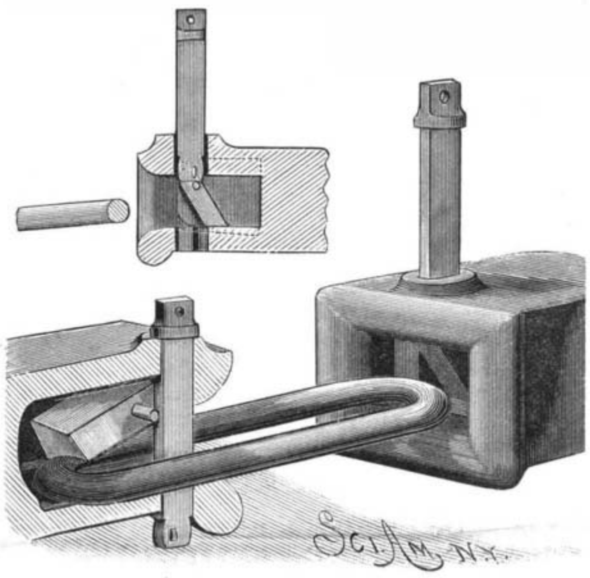
Our illustration, which is from *Engineering*, shows one of the Compagnie Generale's depositing boxes, with blue ground in the box and trucks loaded therefrom ready to be drawn away to the depositing floor. An empty tipping tub is shown on the standing wires over the box ready to be lowered down again into the claims. The Kafir sitting on the box has to hook an anchored wire on to the hanging bar of the tub as it passes over him, by which means the tipping of the tub is effected, the tub itself being so balanced that it quickly rights itself again after tipping. The bottom of the depositing box is formed of iron grating, whereby the coarse lumps of blue ground are sifted from the finer ground, which passes into the lower receptacle of the depositing box and is trucked away separately, thus facilitating the process of pulverization.



THE AFRICAN DIAMOND INDUSTRY.—A DEPOSITING STAND.

IMPROVED CAR COUPLING.

This coupling may be used on any form of car, but is especially applicable for use on freight cars. It may be used in connection with the ordinary pin and link coupling. The drawhead is formed with the usual opening, and in the upper portion are two recesses, within which are pivotally mounted tumblers, whose forward faces are recessed. The tumblers are connected



REQUA'S IMPROVED CAR COUPLING.

by a cross rod so located that, when in the position shown in the upper sectional view, the rod will be beneath the coupling-pin hole, the pin being provided at its lower end with a cotter which prevents it from being entirely withdrawn. The tumblers serve to hold the extended end of the coupling link elevated when arranged as shown in the left of the lower figure, the lower wall of the main opening being inclined so that the link will be raised to a position to couple automatically with the adjacent car. In the drawhead into which the link enters, the pin is supported by the cross rod uniting the tumblers, which are swung down. The entering link strikes and throws the tumblers back, so as to permit the pin to drop into the link.

This invention has been patented by Mr. Mark M. Requa; particulars can be obtained from Mr. B. A. Mann, of Lanesborough, Minn.

Electrical Resistance of Carbon.

The principle of the carbon telephonic transmitters is briefly this: A button of carbon is placed between two metal conductors, one of which, being in contact with the vibrating membrane, is made, when the telephone is used, to bear with varying pressure on the button of carbon, thus changing the resistance of the circuit, and so varying the current flowing therein. Previously, the diminution of resistance corresponding to the increased pressure has been held to be due to the better contact of the carbon and the metal caused by thus squeezing them together. This view has been opposed by Mendenhall (*American Journal of Science and Arts*), and his later experiments make good his position. He finds, using soft carbon or compressed lampblack, that the resistance of this material varies greatly with pressure, and that the greater part of this change is due to a real change in the resistance of the carbon itself, and only a small portion of the variation is due to the surface contact. He found that a comparatively great pressure would sometimes result in a permanent reduction of the resistance of the carbon; and that this resistance is so uncertain and fluctuating, that it is extremely doubtful whether this phenomenon could be applied so as to give a measure of the pressure exerted.

Chinese Straw Shoes.

We understand that Dr. Macgowan has sent to the Agricultural Bureau, through Consul-General Kennedy, of Shanghai, a collection of shoes made of rice straw, and worn by laboring people in the south of China. Dr. Macgowan sends them, suggesting the introduction of rice-straw shoe making into the rice-producing regions of the South. They are made by women and others who are too feeble for more active employment, which circumstance, and the abundance of the material, render them very cheap—from one to twelve cents per pair!

Dr. Macgowan suggests also the introduction into nurseries for children's wear of these straw shoes, that more freedom be allowed to the feet of our children.

The highest priced shoes—12 cents—are made of mat grass (*Arundo mites*), which Dr. Macgowan says should be acclimated in the South, and that mat making would prove a profitable industry.

The Electrical Railway in Minneapolis.

The *Electrical Review* contains an interesting account of the successful operation of the electrical railway in Minneapolis, in which it says: "The trains consist of three or four passenger cars, each weighing 11 tons empty. The number of passengers carried is often as high as 600 at one time, so that the weight of the train is as follows: Four cars, each 11 tons, 44 tons; 600 passengers, at 130 pounds, 39 tons; motor car, 8 tons; total, 91 tons. The steam dummy now brings the train to as far as the steam is allowed, and then the electric motor relieves it and takes the train down town with its passengers. The distance over which the electric motor travels is at present somewhat near a mile, the speed being about seven miles an hour, this being the regulation speed within the city limits. Considering the constant stopping and starting at each block, the grades in the road, and the heavy trains, the electric motor must be given the credit of doing at least as good work as could be expected or obtained from any steam engine. During the seventeen or eighteen hours of service, not a single minute of stoppage is made except to let off and take on passengers. This electric road has been in operation for several weeks without a hitch or a breakage. The motor, which is about 40 horse-power, works as perfectly under a heavy as under a light load. From the permanency and the character of the work done by this electric railway, it will be seen that electric railways on elevated as well as on ordinary roads must become facts in the immediate future. They are indeed now with us, and there is no more trouble to build 200 or 300 horse-power generators than to build machines of fifty horse-power. The public is losing its skepticism, and what was proclaimed as an impossibility yesterday has become a fact to-day."

THE GYROSCOPE.

(*Continued from first page.*)

While this phenomenon can be perfectly shown only by means of an instrument in which the power is practically constant and the velocity uniform, the tendency of the gyroscope to act in this way may be exhibited by means of an ordinary one revolving at a high velocity. The difficulty of securing a high speed in a large gyroscope has led to the application of a friction driving device, as shown in Figs. 1 and 2, by means of which an initial velocity of from 4,500 to 5,000 revolutions per minute may readily be attained.

The instrument, after being set in motion, behaves like other gyroscopes not provided with means for maintaining the rotary motion of the wheel, but the size of the instrument and the facility with which it may be operated render it very satisfactory.

The gyroscope wheel is 6 inches in diameter, ⅝ inch thick, and, together with its shaft, weighs 3½ pounds. The annular frame weighs 1¾ pounds. So that 5¼ pounds must be sustained by gyroscopic action when the counterbalance is not applied.

The driving wheel is 7¾ inches in diameter. Its face is ¾ inch wide. Its shaft is journaled in an arm pivoted to the base, with its free end adapted to enter a recess in the edge of the annular frame, for supporting the gyroscopic wheel while motion is being imparted to it. Upon the shaft of the gyroscope wheel is secured a soft rubber tube having an external diameter of nine-sixteenths inch. This shaft makes 13·84 revolutions to one turn of the drive wheel, so that when the drive wheel is turned six times per second the gyroscope wheel will make very nearly 5,000 turns per minute (4,982).

This gyroscope may be arranged as a Bohnenberger apparatus by removing the tall standard and attaching the shorter one to the center of the base by means of a bolt. The annular frame of the instrument is suspended on pivotal screws in the extremities of the semicircular support, which is capable of turning on the upper end of the short standard. In the engraving the short standard, together with the semicircular support, is shown lying on the table. The usual counterbalance is also shown lying on the table. Fig. 1 shows the drive wheel in position for imparting motion to the gyroscopic wheel, and Fig. 2 shows the driving wheel withdrawn and the gyroscope in action.

As this instrument does not differ from the ordinary one, except in the application of the driving mechanism, it will be unnecessary to go into particulars regarding its performance.

In Figs. 3, 4, and 5 are shown pneumatic gyroscopes, and Fig. 6 represents a steam gyroscope.

The pneumatic gyroscope shown in Fig. 3 consists of a heavy wheel provided with flat arms arranged diagonally, like the vanes of a windmill. The wheel is pivoted on delicate points in an annular frame having an arm pivoted in a fork at the top of the vertical support. The arm of the annular frame carries a tube, which terminates near the vanes of the wheel in an air nozzle which is directed toward the vanes at the proper angle for securing the highest velocity. The opposite end of the tube is prolonged beyond the pivot of the frame.

The support of the annular frame, shown in vertical section in Fig. 4, consists of an inner and outer tube, the inner tube having a closed upper end terminating in a pivotal point. The lower end of this tube communicates with the horizontal tube, through which air is supplied to the machine.

A sleeve, closed at its upper end and carrying the fork in which the arm of the annular frame is pivoted, is inserted in the space between the inner and outer tubes, and turns on the pointed end of the inner tube. The inner tube is perforated near its pointed end, to permit of the escape of air to the interior of the sleeve, and the lower end of the sleeve is sealed by a quantity of mercury contained by the space between the inner and outer tubes. The air pipe carried by the annular frame communicates with the upper end of the sleeve by a flexible tube. When air under pressure passes through the inner pointed tube, through the sleeve, and through the air nozzle, and is projected against the vanes of the wheel, the wheel rotates with great rapidity, and the gyroscope behaves in all respects like the electrical gyroscope above referred to.

The gyroscope shown in Fig. 5 is adapted to the standard just described, but the heavy wheel is replaced by a very light paper ball, whose rotation is maintained by two tangential air jets, which play upon it on diametrically opposite sides, and nearly oppose each other, so far as their action on the surrounding air is concerned. The rotary motion is produced solely by the friction of the air on the surface of the ball. The upwardly turned nozzle is arranged to deliver an air blast which is a little stronger than that of the lower nozzle, so that a slight reactionary force is secured, which assists the gyroscope in its movement around the vertical pivot sufficiently to cause the ball to maintain its horizontal plane of rotation continuously. In fact, this gyroscope will start from the position of rest, raise itself in a spiral course into a horizontal plane, and afterward continue to rotate in the same plane so long as air under pressure is supplied.

It may be questioned whether this machine is a true gyroscope. However this may be, it is certain that the reactionary power of the stronger air jet is of itself insufficient to produce the motion about the vertical pivot; neither is there a sufficient vacuum at the top of the ball to produce any appreciable lifting effect.

The steam gyroscope shown in Fig. 6 hardly needs explanation. It differs from all of the others in generating its own power within its moving parts. The boiler is supported by trunnions resting in a fork arranged to turn on a fine vertical pivot. The engine is attached to the boiler, so that both engine and boiler swing on the trunnions in a vertical plane. The wheel of the engine is made disproportionately large and heavy, to secure the best gyroscopic action.

The performance of the steam gyroscope, is like that of the other power-propelled gyroscopes, and needs only a reactionary jet of steam or some other slight force to keep up the rotation around the vertical pivot, and thus render the action of the instrument continuous.

It has been suggested that, as the engine makes from 1,000 to 2,000 revolutions per minute, the exhaust steam might be turned to account in producing the reactionary effect necessary to maintain the action continuously.

A NOVEL FLOWER POT.

The flower pot shown in the accompanying engraving is the invention of Mrs. S. L. Hunter, of Little Rock, Ark. The pot is made with two walls forming a space between them that serves as a water reservoir. In the inner wall near the bottom are holes through which the water flows to moisten the earth. Fixed to the side of the outer wall, and communicating with the reservoir by a hole, is a spout through which the reservoir may be filled or emptied as required. By thus admitting the supply of water at the bottom, the plants are made to send down deep roots in the earth to seek the moisture, and they will not be so liable to send out roots near the surface, as in the case of pots supplied by pouring water on top of the packed and hardened earth. Plants set in these pots may be transported a long distance, as the reservoir holds water sufficient for many days.

A Mighty Petroleum Fountain.

Mr. Charles Marvin, writing to the *Pall Mall Gazette*, says:

The Russian newspapers just received contain a telegram from Baku announcing the greatest outburst of oil ever known. It runs thus: "Baku, October 5.—At Tagieff's wells a fountain has commenced playing at the rate of 30,000 poods of petroleum an hour. Its height is 224 ft. In spite of its being five versts from the town, the petroleum sand is pouring upon the buildings and streets." It is astonishing that the St. Petersburg correspondents of the London papers should not have telegraphed this remarkable phenomenon, and I can only account for their remissness on the grounds that they have either been too preoccupied with Bulgarian matters or have grown so accustomed to fresh oil fountains at Baku lately as to be blunted to the significance of the present one. Yet Tagieff's "gusher" beats out and out every previous record in the oil regions of the two hemispheres. The champion petroleum fountain up to now has been the "Droojba," which in 1883 spouted to the height of 200 ft. or 300 ft., at the rate of nearly 3,300 tons of oil a day. "This single well," I wrote from the spot in that year, "is spouting more oil than all the 25,000 wells in America yield together."

Such an outflow was looked upon as almost incredible, and had there not been other Englishmen at Baku at the time, I should have probably fared as badly as Bruce and other travelers. But the Droojba is now nowhere. Tagieff's well is spouting nearly 500 tons an hour, or more than 11,000 tons of oil a day. If it were in London, it would top the Monument by 20 ft., and the mansions of far off Belgravia would be covered with its greasy dust. During the birth throes of a Baku oil fountain, stones are hurled a terrific distance, and a high wind will carry the fine sand spouting up with the oil miles away. The roar of the gas preceding the oil flow is terrific, and the atmosphere for a time is rendered almost unbearable. Compared with such fountains as the Droojba and Tagieff, the Great Geyser of Iceland is a pygmy. Luckily the gas soon clears off, the stones cease to rattle about the surrounding buildings, and then the fountain becomes as orderly as those in Trafalgar Square, pouring upward sky high with a prodigious roar, and forming round about the 13 in. or 14 in. orifice vast shoals of sand, beyond which the petroleum gathers in lakes large enough sometimes to sail a yacht in.

How long Tagieff's "spouter" will last, and what its ultimate yield will be, will depend upon circumstances. The Droojba lasted 115 days, flowing for 43 days at the average rate of nearly 3,400 tons a day, 31 days at 1,600 tons, 30 days at about 900 tons, and 11 days at 600 tons. The owners then managed to fix a "cap" over the orifice, and placed the well under control. The total amount of oil spouted, at the very lowest estimate, was 220,000 tons, or 55,000,000 gallons; the highest estimate put it at 500,000 tons. At a rough estimate, had the oil spouted in America, it would have realized about a million sterling, and made its owner a millionaire, instead of which the fate of the fountain at Baku was to render its master a bankrupt; for the shoals of sand engulfing neighboring buildings led to claims of damage surpassing what he got for the small quantity of oil he was able to catch and store, while the rest, flowing beyond on to other people's property, was in most cases "annexed" and not paid for. It is to be hoped that Tagieff & Co. will not be so unlucky; but in any case most of it is sure to be wasted.

Lechesne.

"Lechesne" is an alloy of nickel, copper, and aluminum for the production of a superior kind of *maillechort*, or German silver. It is recommended as combining absolute malleability with an exceptional degree of homogeneity, tenacity, and ductility. The inventor, M. Thirion, claims also for the new metal less liability to oxidize and to act as a heat conductor than other alloys heretofore in use. These latter advantages, he holds, are conspicuous on a comparison of the new alloy with those of nickel and copper for coinage, and with the old fashioned descriptions of German silver (nickel, copper, and zinc), or, again, with the best kind of latten. Like gold, silver, and platina, the "lechesne" alloy satisfies the conditions of the most difficult processes that could be applied, such as hammering, drawing, and deep chasing or punching, especially in ornamental work. The distinctive feature of this metal consists in the addition to the binary alloy (nickel and copper) of a quantity of aluminum, calculated according to the proportion of the nickel. The aluminum is introduced a few moments before the casting process, care being taken to send it to the bottom of the fusion, and to insure thorough distribution throughout the mass by vigorous mixing. Its combination is facilitated by its natural affinity to both copper and nickel. The proportion of the aluminum entering into the alloy is as follows: One gramme 65 centigrammes per kilo of alloy containing 10 per cent of nickel. Any attempt to deoxidize an alloy of nickel and copper in which the aluminum was not carefully introduced toward the close of the fusion would lead to carbureting. If it were sought, for instance, to expel the surplus carbon by superheating, the inadequate quantity of free oxygen present would prevent the combustion of the carbon, so that the metal would in reality become even more deteriorated by the process by an increased oxidization. The aluminum both deoxidizes and decarburets the metal, but the following precautions should be observed: The nickel is first placed in the crucible, and as soon as it melts, the copper is gradually introduced, the vessel, of course, being closed. When the two metals are in a state of fusion, they are puddled together. Then the alloy is reheated and the aluminum thrown in, the temperature being rapidly raised almost to boiling point. In the next place the alloy is cast very hot, this operation being effected promptly and with the utmost regularity. The chief malleableness of the article is derived from the copper, which imparts a property and a tone in that respect found lacking in the nickel. The aluminum suddenly, but surely, oxidizes the alloy, burning away every trace of the carbon introduced into the crucible by the raw material; it considerably augments the tenacity of the alloy, and, above all, insures its compaction. The new metal is regarded in industrial circles as likely to effect considerable changes in many branches of trade, and has already been experimentally tested, with the most gratifying results.

Piston Valves for Locomotives.

According to M. Ricour, piston valves in locomotives wear at the rate of one twenty-fifth inch for 125,000 miles, while with the slide valve the same extent of wear takes place with one-sixtieth of the mileage. The wear of the valve gear is reduced in the same proportion. The effect in the consumption of fuel is shown by the returns made at Saintes Station for the year 1882, where on all engines worked with slide valves the coal consumed per 1,000 tons conveyed one mile was 226 lb., against 234 lb. in the year 1884, when 30 out of 40 locomotives had been fitted with cylindrical valves.