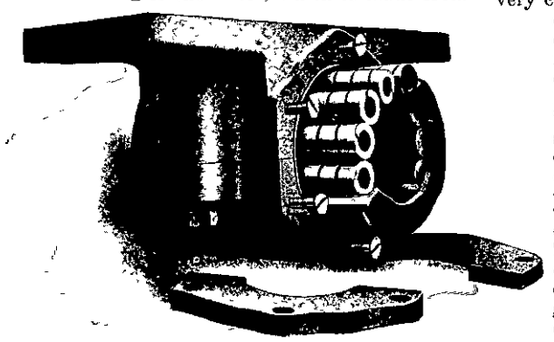
The Hyatt Roller Bearing.

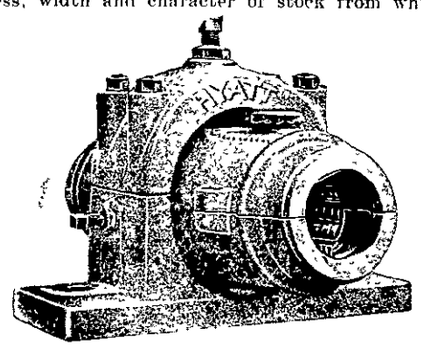
This is an important invention worthy the notice of engineers all the world over. It is claimed for it that this well-known flexible roller bearing corrects the errors of the principal types of bearing, and has besides merits and advantages of its own. In the ordinary bearing, for example, the load must be carried on a limited number of points of contact, a condition, immaterial in bicycles, sewing machines, and machines of that class, but where the saving of power is essential very defective.

The distinctive feature of the Hyatt Flexible Roller Bearing is the roller, which is made from



The Bearing (for a cart axle) open for inspection

a strip of steel wound into a coil or spring of a unform diameter. The greatest advantage of a roller of this construction lies in its flexibility, enabling it to present at all times a bearing along its entire length, resulting in a uniform distribution of load on the roller itself, as well as the surfaces on which and in which it operates. All tendency, therefore, to distortion of these surfaces is entirely eliminated, for the roller will adjust itself to all irregularities that may be present, there being no necessity for hardening the various parts of the bearing, any soft steel surface satisfactorily answering all requirements. It will also be seen from its construction that the roller essentially acts as an oil reservoir, while the spiral and roller together perform the function of an oil carrier, thereby assuring perfect lubrication of all parts at all times, making it possible to operate the bearing for a considerable interval without attention. By varying the diameter of the roller as well as the thickness, width and character of stock from which



The Bearing (for a Shaft) ready for work.

it is made, it is possible to so vary its nature as to enable it to operate under the most varied conditions, from the heaviest load on one hand to the highest speed on the other.

Of this type of roller there are now over two million in use. The Hyatt Roller Company, of London, are the manufacturers; they have wide ramifications in the old and new worlds. Messrs. E. W. Hursthouse and Co., 156 Featherston street, Wellington, are the sole agents for the Dominion. They record having supplied several firms and hear that the bearings are giving great satisfaction.

Roller and other Bearings.

(By Geo. B. Woodruff.)

Paper read before the Institute of Marine Engineeers on Jan. 13, 1908.

The roller bearing dates back too far for my recollection, and has been used for scores of years for various purposes with varying degrees of success. Up to about 1886, all roller bearings, as far as I know, which were used commercially, were composed of solid rollers made of solid bars of steel and carried in various kinds of cages, and sometimes without cages at all. There were, I believe, some makes where steel tubes were employed in place of the solid rollers. They were all alike in one respect, however, viz., that they were rigid and had no flexibility longitudinally. This fact has been the cause of failure in 99 out of 100 cases of failure where roller bearings have been applied to machinery in general. Recognising this fact, Mr John W. Hyatt, inventor of the well-known material called "celluloid," undertook to remedy this difficulty.

The first attempt in 1886 was the introduction of a roller bearing without cage or guide of any sort, and for rollers he simply used discs half-inch diameter by quarter-inch thick. These were very closely fitted in a box, and so arranged that one circle of discs might pass another without catching. This trial worked very satisfactorily, but it was prohibitive on account of the cost. The next trial was with discs 1½in. diameter, and about 1½in. long Thin steel plates were used between the series of discs to prevent the possibility of catching. This was also successful, but too expensive, like the first trial. The next effort was to find out the qualities of a solid roller where the length of the roller exceeded its diameter by two or more times. The first trial was made without any guide or aligning device, and the result was bad in every respect. The subsequent use of a guide was found to be a great improvement over the bearing not having any, but this did not satisfy all the requirements, as rigidity of the solid rollers not only caused vibration and objectionable noise due to the transit of the roller from the free to the tight or loaded side of the journal, but also undue wear to all parts.

Prior to the advent of the spiral rollers, many experiments were made with wood rollers of various kinds. Some were compressed endwise, with the grain in moulds under heavy pressure. This reduced the length about 25 per cent., and increased its strength also. The rollers were 1½in. diameter by 1¼in. long, and a set of bearings of this kind were used on a countershaft for over a year, and operated without lubricant of any kind. The rollers were also made of sections of wood, with binding plates between each section, the plates being forced into each section by means of a mould and hydraulic pressure. Various other kinds of rollers were made up of great numbers of cardboard discs with steel end plates and through rivets, rollers of vulcanised fibre rod, and rollers of vulcanised fibre tubing with hollow metal core, were also tried. The last act was to seize the idea of a spirally wound roller of flat bar steel. Four bearings were made up with roller about 1¾in. diameter 12in. long, operating on a shaft 4½in. diameter at various speeds and loads giving good results throughout. No means for keeping the rollers in a line were used for several weeks. Eventually, however, the guides of various types were used, as indications prompted. Finally the present form of guide resulted and the Hyatt Flexible Roller Bearing was put on the market about eighteen to twenty years ago. Many improvements have been suggested by experience as to proportion of roller diameter to the journal speed and load to be carried.

Considering anti-friction bearings generally, there are three distinct types: ball bearings, the solid roller bearings, and the flexible roller bearings. Considering each type separately, the ball is well known, and for light loads, it is undoubtedly a most desirable type, but for heavy loads, on account of having only points of contact, abrasion of races and breaking of balls is frequently the result. If very large balls are used, then the bearing becomes very expensive. There is also always a certain amount of uncertainty about ball bearings, on account of the liability of balls breaking. Users of motor cars can vouch for this statement, as they have, in many cases which have come to my notice had a great deal of trouble owing to breaking of balls, which tears the entire bearing all to pieces. As regards the application of ball bearings to line shafting, there are several objections to this, the principal of which is the difficulty in getting the bearings on to the shaft, or off it. If the shaft is being put up new, of course the ball race which fits on the shaft can be put on without any great difficulty, although if you buy your shafting with the couplings fitted on and faced up, it is rather awkward to remove these couplings for the purpose of getting on a small bearing. After the shafting is put up and in position, if by any chance a ball breaks and the bearing is generally torn up, which it is sure to be, in order to get this bearing off and another one on it will be necessary to take off the old races and put on the move a half coupling, and take off the old races and put on new ones This is altogether too much labour and too costly. Further than this, the cost of ball bearings for line shafting is rather excessive at the present time. With the ordinary type of roller bearing, the same can be applied to a shaft as easily as the common brass or white metal bearing. Regarding the solid roller bearing, on account of the rigidity apparent from its construction, it cannot in its practical operation in a bearing, have contact along its entire length. It is impossible, therefore, to secure a uniform distribution of load, either on the face of the roller or the axle or the shaft causing distortion and gradual destruction of the roller as well as the surfaces on which and in which it operates. The irregularities causing this lack of contact and inequality of pressure, may be caused in various ways, such as the slight deflection of the shaft, yielding of supports, imperfection in the manufacture, or mounting of the bearing. Such irregularities cannot be eliminated and are sure to be present in practical work, no matter what the conditions may be, and have a tendency to increase in such applications in which practice will not permit bearings to receive great care, or where the work may be more or less crude Such in general are the conditions under which the solid steel roller operates, and make it necessary not only to harden the roller, but to provide all surfaces on which and in which it runs, with hard ground and steel sleeves, all of which have a tendency to complicate construction, as well as increase the cost, at the same time reducing, not eliminating the objectionable features. We see, therefore, that with the roller we have increased the number of points of contact by which the load is distributed, but on the other hand, we have not secured a line of contact of the maximum number of points as expected on account of the imperfection that is always present, and the ridigity of the roller. The distinctive feature of the Hyatt Flexible Roller Bearing is the roller, which is made from a strip of steel wound into a roll or spring of uniform diameter. The greatest advantage of a roller of this construction lies in its flexibility, enabling it to present at all times a bearing along its entire length, resulting in a uniform distribution of load on the roller itself, as well as on the surfaces on which and in which it operates. All tendency, therefore, to destroy these surfaces is entirely eliminated, for the roller will adjust itself to irregularities that may be present, there being no necessity for hardening various parts of the bearing, any soft steel surface satisfactorily answering all requirements. It will also be seen from its construction that the roller essentially acts as an oil reservoir, while the spiral and roller together perform the function of an oil carrier, thereby assuring a perfect lubrication of all parts at all times, making it possible to operate the bearing for considerable intervals without attention. By varying the diameter of the roller as well as the thickness, and character of stock from which it is made, it is possible to so vary its nature that you enable it to operate under the most varied conditions, from the heaviest load on the one hand, to the highest speed on the other. To sum up the various features of three types of bearings, we have been discussing, we find as follows:—

Steel Balls.—Applicable for light duties principally, they having insufficient contact to properly support heavy loads. Must be hardened and ground, and require surfaces similarly prepared. Liable to fracture, due to sudden shock or defective temper.

Solid Rollers.—Applicable to heavy loads, there being more contact with supporting surface than with the balls. Must be hardened as well as the surface on which they operate to ensure even reasonable durability. Support for load consists of a series of points, not a line, because rollers are rigid and cannot conform to irregularities always present. Not applicable to high speed. Liable to fracture, as in the case of the ball.

Flexible Rollers.—Applicable to all speeds and loads, due to ability to vary their nature—light flexible rollers used for light work—heavy, more rigid rollers where duty is heavy and speed slow. Roller cannot crush, for it is designed to support the load with proper factor of safety

(To be Continued)