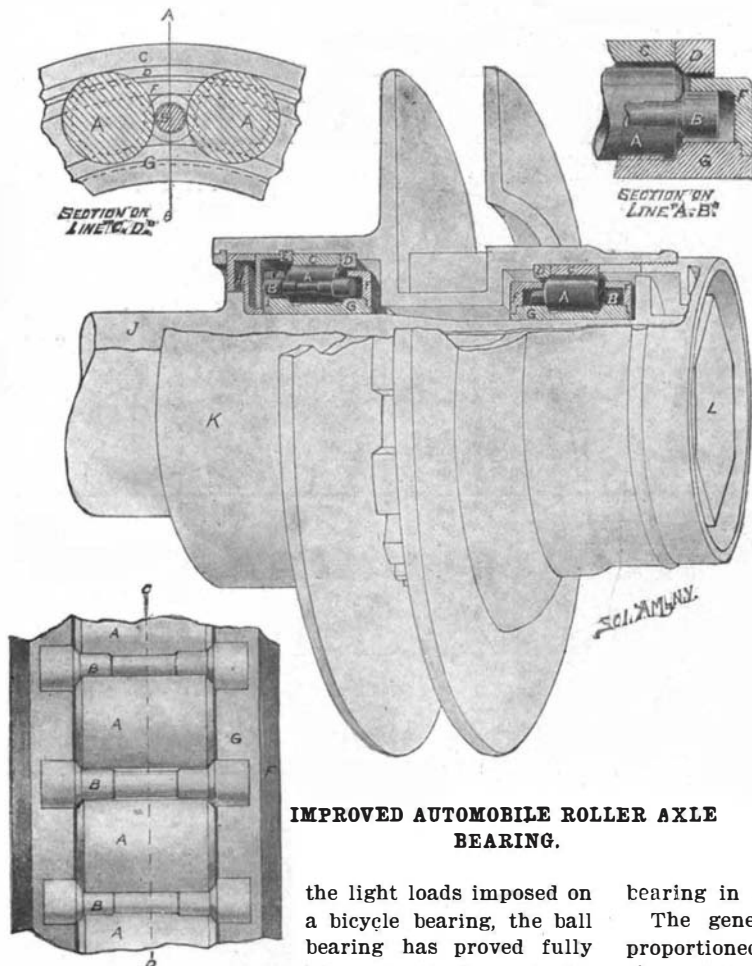


AUTOMOBILE ROLLER AXLE BEARINGS.

The simplest and oldest form of bearing is undoubtedly the plain or parallel axle bearing. It is as old as history itself, and we might be using it yet had it not been for the advent of the bicycle. The writer of the present article well remembers how, in the late seventies, he rode machines that were successively equipped with the plain parallel bearing, the cone bearing, the roller bearing, and finally the single and double ball bearing. Each of these sought to improve upon the original parallel bearing by reducing friction and providing a means of periodically taking up the wear. The plain and the cone bearings were subjected to rubbing friction, the roller and ball bearings to rolling friction. For reasons which will be subsequently explained, the early roller bearings were a failure and soon ceased to be a serious competitor to the ball bearing, which at once proved its absolute superiority to any other type for use in bicycles.

It is not necessary here to demonstrate the superiority of a rolling over a rubbing friction in bearings; and were the question of a perfect bearing a question of friction merely, the ball bearing would stand to-day as the perfect bearing for every conceivable class of work. There are, however, other elements which are of vital importance, especially in bearings intended to carry the heavy loads and be subjected to the violent shocks which are imposed in the modern automobile. We refer to the question of wear and adjustment. As regards the wear, while it is true that under



IMPROVED AUTOMOBILE ROLLER AXLE BEARING.

the light loads imposed on a bicycle bearing, the ball bearing has proved fully adequate to long continued service, when it comes to be subjected to the extremely heavy loads and severe shocks encountered in the automobile, to say nothing of heavy truck or railroad car service, it is found that much larger bearing surfaces are necessary than are provided by the limited contact surface between the ball and its race. Hence it was natural that in searching for a type of bearing which would give this increased bearing surface, inventors should take up, once more, the discarded roller bearing of bicycle days and endeavor to adjust it to modern conditions. Here, apparently, was a complete solution of the problem of adequate bearing surface, and the new types of roller bearing were put upon the market with every confidence that they would meet the conditions of low coefficient of friction combined with adjustability and endurance. It was found, however, that there was a new and unsuspected weakness in the roller bearing, which has proved to be really the most troublesome defect of all. We refer to the necessity of maintaining absolute parallelism between the rollers. It was discovered that if the bearings lost their parallelism they would lose their line contact, and would bear at their center on the inner race and at their ends against the outer race. Under these conditions a heavy cross-bending strain was brought upon the rollers and they were frequently broken. It was found that it would not do merely to place the rollers side by side and trust to their wearing evenly and maintaining parallelism unassisted. Some device for maintaining them in accurate parallel adjustment was essential. So true is this that it is recognized to-day among the makers and users of this type of bearing that the best bearing is the one which has the

best method of control. Moreover, it is scarcely less important to provide some form of separator, otherwise the adjacent surfaces of rollers, since they rotate in opposite directions, will exert a rubbing friction against each other that would defeat the very object of the bearing. Many devices have been adopted for guiding the rollers, among which may be mentioned the use of end slots, cages and pivots mounted in cages. Some of these have considerable merit and have stood the hard service of several thousand miles of work; but they all show more or less weakness in the tendency of the cages to wear away, letting the rollers get out of adjustment, and in the liability of the cages to break under the twisting strains that are brought upon them. There is also a certain amount of friction due to the rotation of the rollers in the cages themselves.

The very interesting roller bearing herewith illustrated, which is manufactured by the American Roller Bearing Company, 32 to 40 Binford Street, Boston, Mass., has been designed with a view to satisfactorily solving this problem of control. It seeks to get rid of the rubbing friction which is ultimately fatal to the roller cage, and to provide a system of separation and control which will not only obviate friction, but which will keep the rollers at all times absolutely in parallelism. We present several views of the details of this device, and also a sectional view of a wide axle bearing, in which two of the standard bearings are used, one at each end of the journal. The bearing consists of a series of large rollers, A, separated by smaller separating rollers, B, which are mounted between the centers of the main rollers, and serve to prevent them from coming in contact. These separators which, like the main rollers and the races, C and G, are made of hardened steel of high tensional strength, have rolling supports at their ends, this support being afforded by the retainer caps, F. The enlarged ends of the separators bear on the races in these caps and are so proportioned that they travel around in perfect harmony with the main rollers without slipping or dragging. Even at the slower speeds, centrifugal force keeps the separating rollers in contact with the retainer caps, so that they have no bearing on the sleeve. At the same time this inner sleeve prevents them from dropping out of place when the speed is too slow. Now, it will be noticed that instead of utilizing the cages ordinarily used, the main rollers, A, are kept in place by their beveled edges bearing against the beveled enlarged ends of the separators. Before any given bearing could get out of lateral adjustment, or swing around out of parallel with the axis of the bearing, it would have to stretch and break the shank of the steel separators. In other words, the whole tensional strength of the separators is available to keep the bearing in absolute alignment.

The generous bearing surfaces and the carefully proportioned parts, which have been so adjusted that the metal is never strained as in other bearings up to and beyond its breaking strength, are features that have combined to give to this bearing the extremely low coefficient of friction of 0.00127, as shown in laboratory tests, and a practically negligible amount of wear.

The development of this bearing was carried out in the automobile field, and the success achieved has led to its application to general carriage, wagon and truck work, and to that most severe of tests, the trolley and railroad service. The bearing has stood up so well under heavy trucking that steps are now being taken to enter that most severe field of trolley and railroad service.

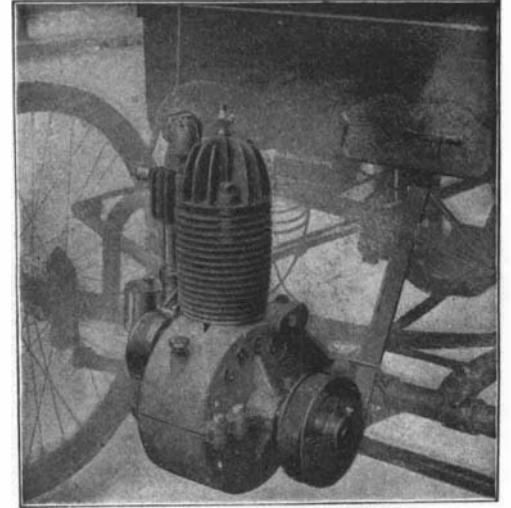
This is the third year of the bearing in active service and the results seem to be proving the claims of the bearing. It is found that the bearings need attention about once in three to six months according to the service. The saving in care is therefore an important element.

An interesting test was made recently with two heavy caravans of a Boston transportation company, one fitted with American roller bearings and one with plain bearings. The roller bearing van had been in service for ten months, and both vans were of the same type. They were loaded equally and a series of draw-bar pull tests made on various kinds of roadbeds. An average of all the readings on both vans showed a net saving of 26.5 per cent for the roller bearing van. These bearings had received attention but once during the ten months and showed no perceptible wear.

Dr. Theodore W. Richards, who was recently called to the Chair of Chemistry at Göttingen, has been elected Professor of Physics at Harvard University.

AUTOMOBILE NOVELTIES.

THE CREST MOTOR STARTER.—A very handy device for starting the motor from the seat of the carriage is shown in the annexed cut as applied to the light runabout of the Crest Manufacturing Company. The apparatus consists of a drum on which is wound a belt that passes up through the floor of the vehicle and ends in a suitable handle. Fastened to the inside of the drum is a ratchet that some pawls on a plate keyed to the shaft of the motor, engage. A pull on the strap, therefore, turns the motor, after which a spring in the drum revolves it backward and re-winds the strap.

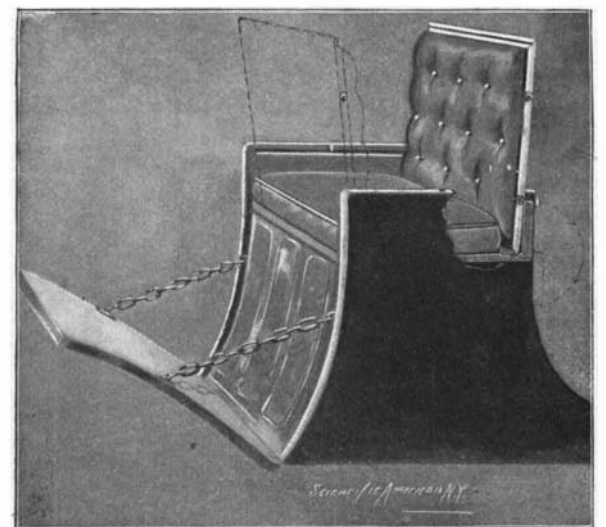


CREST MOTOR STARTER.

As soon as the motor starts, the pawls are thrown out of engagement with the ratchet by centrifugal force, and so produce no clicking noise.

The motor on the Crestmobile also carries a novelty in the shape of an exhaust valve lifter, by which the valve can be raised when the carriage is coasting, and the motor allowed to aspire cool air instead of an explosive mixture. This is one of the patented features of the Crest air-cooled motor.

MR. ELIHU THOMSON, who is one of our best-known inventors, is the assignee of a patent recently granted to Otto F. Persson, of Lynn, Mass., for a novel reversible automobile seat. The back of the seat is provided with a double set of projections which work in closed-end slots formed in the back-supporting pieces. An opening is located between the ends of each slot in order that the seat may be inserted and removed. It is evident from this construction that the seat can be easily placed in the slots, shifted either forward or backward, and thus readily reversed. The ends of the



A NEW REVERSIBLE AUTOMOBILE SEAT.

slots are somewhat enlarged, so that the lower edge of the seat may fit into a notch in the seat in order to provide a rigid support.

THE HENDRICKS MAGNETO.—Instead of a miniature dynamo, the Hendricks Novelty Company make a magneto with permanent magnets, for gas engine ignition. The claims of this company for a patent on a speed governing pulley that is applicable to any small dynamo or magneto have, we are informed, just been allowed, and the company intends putting the device on the market in the near future.

THE COVERT RUNNING GEAR AND TRANSMISSION.—To anyone contemplating building his own automobile, the light runabout furnished by Byron V. Covert & Co. offers many advantages. The running gear is sold complete, with two clutches operated by a single lever all on, and the body attached also, if desired. All that is necessary to complete the rig is a suitable light motor. The company are now getting out a very neat complete vehicle of this type, which, ready to run, weighs only 400 pounds.

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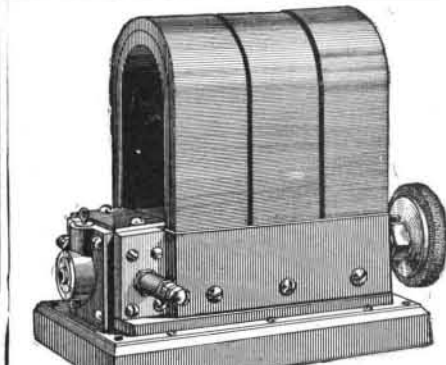
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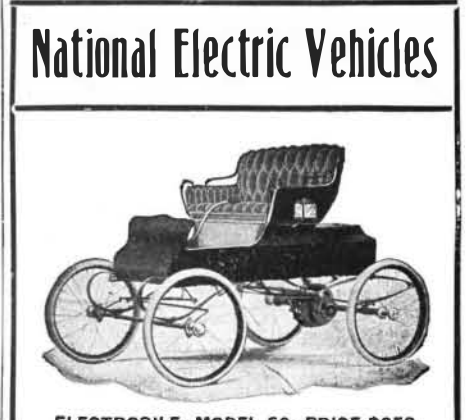


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Science Notes.

The construction cost of the Pan-American Exposition of Buffalo was \$9,000,000; of the Paris Exposition of 1900 is said to have been \$10,000,000; of the World's Fair at Chicago \$18,000,000, while St. Louis will spend \$30,000,000 in building her Louisiana Purchase Exposition in 1903.

K. Dieterich has applied for the patent for an extremely sensitive test-paper, which will indicate the presence of minute traces of alkali, as little as 1:1,000,000 of ammonia being detected by its means. An alcoholic solution of shellac and fluorescein is painted on a neutral black background. In the presence of the least trace of alkali this shows the characteristic green fluorescence. It is specially intended for the use of bacteriologists and for food analysts, since its extreme delicacy and relatively high price render it unsuitable for general use.—Pharm. Centralh.

The precocious son of Prof. T. D. A. Cockerell died recently from diphtheria. Though only eight years old he had made a number of quite remarkable discoveries of his own, says Science. He discovered the larva of *Picris occidentalis*, and raised the butterfly. He also found the first psocid recorded from New Mexico, and collected at least three new insects; a new bee of the genus *Epeolus*, described by Prof. Cockerell; a new meloid beetle, now in the National Museum, not yet described; and a new grasshopper of the genus *Melanoplus*, described by Mr. Scudder, and about to be published.

The influence of pressure up to 500 atmospheres on the viscosity of water at temperatures ranging from 15 deg. to 100 deg. has been studied by M. L. Hauser. The capillary tube method was employed, and the chief results were as follows: (1) Up to 32 deg. increase of pressure diminishes the viscosity. (2) In this temperature region the effect of pressure diminishes with increasing temperature. (3) In the neighborhood of 32 deg. increase of pressure up to 400 atmospheres has no effect on the viscosity coefficient. (4) Above 32 deg. the viscosity is increased by an increase of pressure of 400 atmospheres.

L. Portes and A. Desmoulières find that salicylic acid is a normal constituent of strawberries and natural strawberry juice, in which it is probably present as methyl salicylate. It occurs both in wild and cultivated fruits. They controvert the statement of Truchon and Martin Claude that the coloration obtained with ferric chloride in an ethereal extract of strawberry juice is due to a tannin, and demonstrate that the method of removing this advocated by those authors, also removes the salicylic acid. They have further succeeded in isolating the acid in a crystalline condition, and confirm its identity by other reactions.—Journ. Pharm. Chim.

Mr. Edward Dodson, an English explorer, has recently returned from a prolonged sojourn in the great desert of Tripoli, Northern Africa. This portion of the country has never been thoroughly explored, and indeed has not been visited by a European for over fifty years, so that Mr. Dodson's results are of inestimable value. One of the greatest achievements of the expedition was the exploration of the great petrified forest at Murzuk. Throughout this whole area which extended for several miles petrified trees were found, varying in circumference from seven feet to a few inches. Every branch of this forest was of course lying prone, and this together with the presence of marine shells showed that this part of the Great Sahara had at one time been submerged. On one occasion the party passed through a strange experience. They were surrounded by thunderstorms. No less than five distinct storms were in progress all round, and the guns and spears of the party became surrounded by a halo of phosphorescent light.

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Engineering Notes.

An elevated railroad will be built on Market Street, running from the Pennsylvania Railroad station at Fifteenth Street, Philadelphia, westward to Sixty-third Street. It is probable that a subway will be built from Broad Street to the Delaware River, owing to the congested traffic on Market Street.

In Roumania, out of 454 locomotives on the standard gage roads, at the beginning of 1900, 175 had been fitted for burning petroleum residuum, says The Engineer. During 1900 twenty-eight more engines were changed to oil burners. Most of these engines, however, are so constructed that coal or wood, as well as oil, can be burned in them.

The total production of crude petroleum in the United States in 1900 was 63,362,704 barrels, being the largest for any year in our history. It was 6,291,854 barrels larger than that of 1899, the increase amounting to a little over 11 per cent as compared with 3 per cent gain in 1899 over that of 1898. It was greater by 2,402,343 barrels than the previous largest production, that of 1896.

The French Chamber of Deputies adopted, on June 28, the Waterways Bill, which comprises improvements in the existing canals at a cost of \$12,100,000. The construction of the new canals includes one connecting the northern coal fields with Lorraine and another from the Loire to the Rhone, and a third from Marseilles to the Rhone, at a cost of \$88,600,000, and improvements of the ports of Dunkerque, Havre, Nantes, Bordeaux, St. Nazaire and several other places at a cost of \$31,800,000.

The first installation in Europe of the Talbot invention for the rapid manufacture of steel has been made at the Frodingham Iron and Steel Company, Lincolnshire, England. This is the first attempt to reduce this process to actual practical use upon a large scale in the world, since there is only a small experimental furnace in this country. The inventor is a Salopian, but has resided in this country for some years. The furnace is tapped every four hours, and this constitutes a very rapid rate of manufacturing steel.

The firm of Krupp is preparing for a great display of ordnance at the Westphalian Arts Exhibition which opens in Düsseldorf in May next. This is the first thing of this kind done by the Krupps since the Columbian Exposition at Chicago and will be equally as elaborate. This coming display will cost over one million dollars. The exhibit will include types of the largest guns made by the firm, and at one end of the Krupp pavilion there will be shown the full-sized prow of one of the most recent designs in battleships, bristling with guns.

The commercial depression in Germany is developing into an acute question, especially in the iron and machine industries. In Chemnitz there are only three factories working. Orders for locomotives are scanty, and 20,000 workmen are working short time. At Aix out of 6,500 workmen 1,000 are on short time. The Nuremberg Electrical Company have introduced an eight-hour day owing to lack of work. The Breslau metal workers are practically idle, only 3,000 out of 13,000 being at work. In Magdeburg 300 men have been dismissed weekly. Canstatt tells a similar story. In Hamburg 1,200 men are idle and the wages of those at work have in many cases decreased 50 per cent. Employment is precarious. Frequently the weekly earnings amount to only \$1.25. Few, if any, trades have escaped the depression. Furniture firms are everywhere reducing labor, especially in Hamburg, Königsberg, Chemnitz, and Brunswick. Even banks are discharging their employes. The outlook is so serious that active steps are being taken by the governments of Prussia, Bavaria, Hesse, and Baden to meet the distress.



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Wilson's...

NEW GREEN BONE, SHELL AND VEGETABLE CUTTER FOR THE POULTRYMAN...

Also **Bone Mills** for making phosphate and fertilizer at small cost for the farmer, from 1 to 40 horse power. Farm Feed Mills grind fine, fast and easy. Send for circulars.

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For steam boats, sail boats, yachts, docks, mines, dredge boats, fishing jacks, camping grounds, fire hunting, stage illumination, lawn parties, signal lights, locomotive headlights, etc.

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STEAM CARRIAGES

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Portable Electric Torches

All Sizes All Prices **\$2.50**

Manufacturers of **Electrical Novelties**

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The "Covert Motorette"

A powerful, light and simple Automobile at a moderate price. Fully guaranteed in every respect.

Price \$600

B. V. Covert & Co.,
Lockport, N. Y.

Electrical Notes.

An American company has secured concessions for the operation of many European canals by electricity. Altogether 5,000 miles of canals are controlled in England and on the Continent.

The Transalpine telephone line, connecting the systems of France and Italy, was inaugurated January 1. Signor Galimberti, Italian Minister of Posts and Telegraphs, exchanging greetings from Turin with President Loubet in the Palace of the Elysée with entire success. The line was subsequently opened to the public. It does not extend beyond northern Italy. The connection with Rome has not been completed.

A record feat in armature winding is claimed to have been accomplished by the Niagara Falls Power Company recently, which re-wound a 5,000 horse power armature at the Falls power house in five days. In order to perform this work in the required time, a double shift of ten men was kept working day and night. An interesting feature of the work was the use of a small electric motor to blow the blacksmiths' forge, on which charcoal was burned.

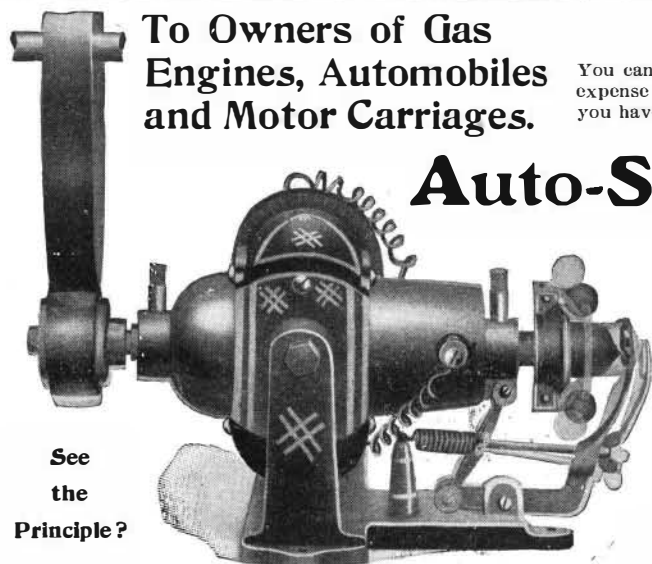
Three furnaces of 500 electric horse power are said to have been erected in the valley of Camonica, Northern Italy, for the manufacture of pig iron under the Stassano patent. The furnaces in general outlines resemble cupola furnaces using coke, their special features being apparent in the provision made for supplying electric current and in the electrodes placed at the bottom of the boshes. To obtain a ton—metric—of metal, 3,000 horse power hours are required, which costs about 18 francs.

Consul Thackara reports from Havre, December 5, 1901, that the Commercial Cable Company, of New York, has laid a new submarine cable between Horta, Island of Fayal, Azores, and Waterville, Ireland. The shore connections at the latter place were successfully made on November 30. This cable, says the consul, is an extension of that laid by the same company in 1900, and increases to four the number of cables operated by the Commercial Company between Canso and Waterville. As Havre is connected by a submarine cable with Waterville, the direct-telegraph service with New York will be benefited by the new cable.

An important invention by Herr Rudolf Bartelmus, an electrician of Vienna, for the prevention of railway accidents, has been subjected to severe experiments by the Austrian Railway Officials' Club. The locomotive for the purpose was worked automatically by means of a contact rail along the entire distance, combined with a dynamo and a steam turbine. In case of any obstruction being encountered on the line, the newly invented device works as a progressive check. That is to say, it gives notice first at a distance of 2,400 yards, then at 1,200 yards, and finally, if the previous signals remain unheeded, at 600 yards from the obstruction the steam is automatically shut off on the engine, and the brakes work, so that the train comes to a standstill.

The Post Office Department has authorized the experimental establishment in Toledo, O., of an electrical appliance to record collections from street and office mail boxes, says The Railway Review. The object of the proposed system is to prevent collectors of mail from skipping boxes. The device is so constructed that whenever a box is opened a record of the opening is signaled to the post office. Where there are a great many boxes, in cities of a population of 100,000 and over, it is thought the system would prove valuable. It would also be a valuable addition in sparsely settled communities, where boxes are a long distance apart. Here, it is reported, collectors frequently skip boxes. This violation of regulations could be entirely prevented if the electric appliance was attached to each box.

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Auto-Sparker.



See the Principle?

You can avoid use of batteries and expense of their constant renewals if you have in their place an

It can be attached to any engine, new or old. An Automatic Dynamo which has been in general use on motor carriages, etc., for more than two years, with the universal verdict by all users that it is practical and a *Pronounced Success*. "You can't fool all the people all the time." Many people have been fooled and disappointed in buying cheap Magnotos and cheap *Motobiger Imitations* but the recent and large increase in our sales indicates that many admit that they were fooled.

MOTSINGER DEVICE MFG. CO., 14 Main Street, Pendleton, Ind.

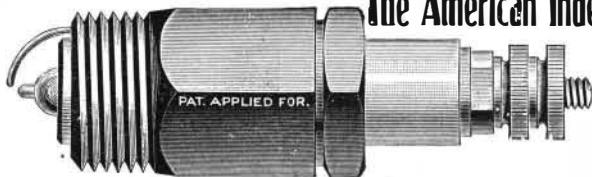
Wire Wheels, Steel Rims, Steering Knuckles.



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Seamless Drop Center, Flat Base and Plain Crescent Rims, all with or without flared edges. In another department we make all sizes of SEAMLESS STEEL TUBES, SEAMLESS STEEL BOILER SHELLS, SEAMLESS STEEL BOILER TUBES, and FLANGED BOILER HEADS.

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Ferry's Seeds make good crops, good crops make more customers—so each year the crops and customers have grown greater. That's the secret of the Ferry fame. More Ferry's Seeds sold and sown than any other kind. Sold by all dealers. 1902 Seed Annual FREE. D. M. Ferry & Co., Detroit, Mich.

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Applied to any boat in a moment. Absolutely practical. Noiseless, Odorless and safe. Nothing to get out of order or explode. Machinery all being in propeller and rudder, saves room in boat. Easiest to operate. Auxiliary power for sail-boat and house-boats. Just the thing for fishing and hunting. Enables you to run noiselessly, steer it and cast or troll as time. For fresh and salt water. Catalogue Free. Submerged Electric Motor Co., Box 6, Menomonie, Wisconsin

CANTON Incandescent Gasoline Lamps give most light for least money. They vaporize gasoline and burn the vapor mixed with air, using an incandescent mantle, and produce 100 to 600 candle power for each burner. The light is steady and strong, and perfectly safe. Average use costs 3c. per week. Handsome fixtures from \$3.50 upward. Everything in gasoline lamps for in-door and out-door use. We have "One match" and also alcohol lighting burners in both overhead and under generators. Ask for catalogue N. The Canton Incandescent Light Co., Canton, Ohio.

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Steam & Sail Yachts, Row Boats, Canoes
Our Catalog gives the truth in detail about the best boats built. Write for it to-day. Look for our exhibit, Sportsman Show, New York, March 5 to 19. RACINE BOAT MFG. CO., Box 86, Racine, Wis.

Insist on "WHITNEY" Automobile Chains. BEST PROPORTIONS. Great Wearing Qualities. Used by Leaders. THE WHITNEY MFG. CO., HARTFORD, CONN.

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THIS IS IT! Paine's Perfect PIPE
Patented April 20, 1897. Simple, Durable, Economical, Clean.
While lighted the inner bowl can be raised to clean or remove obstructions without emptying or wasting the tobacco. No nicotine can enter the stem, as it is all deposited in the smoke chamber surrounding the tobacco bowl. No center draft to leave unburned tobacco around the sides. Openings for smoke opposite the stem, so that smoke passes around bowl before entering the stem, insuring clean, sweet smoke. Pipe never burns out because extra tobacco bowls may be had at a fraction of cost of pipe. PRICES, prepaid by mail to U. S. and Canada: French Briar, bent or straight stems, amberoid mouth piece, 50c. each. French Briar, bent stems, pure rubber mouthpiece, 50c. each. French Briar, first quality, bent or straight stems, amberoid mouthpiece, 75c. each. French Briar, first quality, bent stem, pure rubber mouthpiece, 75c. each. Best quality. Selected French Briar, bent or straight stems, real amber mouthpiece, \$2.00 each. Extra Bowls for 50c. pipes 20c. for all other pipes, 25c. each. EVERY PIPE WARRANTED. Dealers, every pipe you sell will sell others. Write for price list. Address, FRANKLIN R. PAINE, Sole Patentee and Manufacturer, Duluth Minn., U. S. A.

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"U. S." Metal Polish, Indianapolis. Samples free. Inquiry No. 2103.—For machinery used for cleaning carpets by air blast exhaust fan.

WATER WHEELS, Alcott & Co., Mt. Holly, N. J. Inquiry No. 2104.—For makers of lawn mower grinders.

Stencil Machines.—A. J. Bradley, 101 Beekman St. N. Y. Inquiry No. 2105.—For hand or small power ice machines.

Metal substitute, Crane Bros., Mfrs., Westfield, Mass. Inquiry No. 2106.—For dealers in presses, dies, etc., for manufacturing laundry blues.

Handle & Spoke Mch. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O. Inquiry No. 2107.—For manufacturers of hydrogen balloons.

Sheet metal stamping and light manufacturing. For-skeil Motor Co., Anderson, Ind. Inquiry No. 2108.—For makers of china nest eggs.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt. Inquiry No. 2109.—For dealers in magnetic clutches.

Rigs that Run, Hydrocarbon system. Write St. Louis Motor Carriage Co., St. Louis, Mo. Inquiry No. 2110.—For dealers in mucilage, brushes, etc.

For sheet metal stampings and novelties try Standard Stamping Co., Seventh and Hudson, Buffalo, N. Y. Inquiry No. 2111.—For electrical devices for soldering in vacuum.

Ten days' trial given on Daus' Tip Top Duplicator. Felix Daus Duplicator Co., 5 Hanover St., N. Y. city. Inquiry No. 2112.—For dealers in gasoline gas machines for light and fuel purposes.

Are you looking for anything in bent woodwork? Write Tucker Bicycle Woodwork Co., Urbana, Ohio. Inquiry No. 2113.—For a gas meter to register gasoline gas.

MANUFACTURERS! Want any parts made of any metal? Write us. Metal Stamping Company, Niagara Falls, N. Y. Inquiry No. 2114.—For dealers in supplies for systems of speaking tubes.

We develop inventions through their several stages, manufacturing for the market. Amstutz Osborn Co., Cleveland, O. Inquiry No. 2115.—For steel and transfer trucks such as are used in lumber dry kilns.

For Machine Tools of every description and for Experimental Work call upon Garvin's, 149 Varick, cor. Spring Streets, N. Y. Inquiry No. 2116.—For manufacturers of steam toys.

Manufacturers of patent articles, dies, stamping tools, light machinery. Quadriga Manufacturing Company, 18 South Canal Street, Chicago. Inquiry No. 2117.—For a malleable iron or steel foundry to make special castings.

Patents developed and manufactured, dies, special tools, metal stamping and screw machine work. Metal Novelty Works Co., 43-47 S. Canal St., Chicago. Inquiry No. 2118.—For makers of printing ink and colored printing ink in small tubes.

The celebrated "Hornsey-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company, Foot of East 138th Street, New York. Inquiry No. 2119.—For parties desiring to make a bicycle attachment for use on railroads.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail \$4. Munn & Co., publishers, 361 Broadway, N. Y. Inquiry No. 2120.—For makers of woodworking machinery, tools, etc.

WANTED.—Foundry chemist who can also superintend cupolas and produce iron at lowest cost. Young man preferred. Stover Manufacturing Company, Freeport, Md. Inquiry No. 2121.—For dealers in trunks, trunk supplies, etc.

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To be successful, an automobile manufacturer should control and use a patented engine. I will sell patent or right to manufacture such an engine. Address H. B. Ogden, 204 Carroll St., Brooklyn, N. Y. Inquiry No. 2123.—For manufacturers of crepe (mourning) flowers.

Wanted—Revolutionary Documents, Autograph Letters, Journals, Prints, Washington Portraits, Early American Illustrated Magazines. Correspondence Solicited. Address C. A. M. Box 773, New York. Inquiry No. 2124.—For manufacturers of potters' wheels and supplies.

MANUFACTURER WANTED.—For patent shaft-governed high-speed engine, fully demonstrated, authentic tests. All machine works standardized for cheap production. Full working drawings and personal supervision if required. Address Y. K. E., at Horncastle's Advertising Offices, 61 Champside, London, England. Inquiry No. 2125.—For makers of the metal parts of shade rollers.

WANTED.—Reliable, sober and competent foreman for machine shop department. Thorough mechanic, one who understands up-to-date methods of producing work economically and handling men. State experience, give references and salary. Great Western Mfg. Co., Leavenworth, Kansas. Inquiry No. 2126.—For outfits for the manufacture of window and door screens.

Motor Vehicles, Duryea Power Co., Reading, Pa. Inquiry No. 2127.—For the present address of the Columbian Time Recorder Co., formerly of New York.