The Automobile in the Practice of Metropolitan Physicians.

In our desire to furnish our readers with data of a reliable nature in connection with the regular use of the automobile we have interviewed physicians in New York and neighboring cities who have used their machines extensively in their practice and for touring purposes. The following will show what results have been obtained with motor vehicles in urban use, i. e., on macadam, cobble and asphalt streets in good and bad condition.

A Brooklyn physician purchased an electric carriage three years ago and used it in his practice. He could not go as far on one charge as the manufacturers had claimed the machine would go. The batteries deteriorated too rapidly and the vehicle is considered to be too expensive to be a business proposition. If the batteries had a longer lease of life electrics would be ideal vehicles in a physician's practice.

The doctor then purchased a light steam carriage that had been used three months; this was a year ago. Thus far both vehicles have cost about $60 for tire repairs.

All the automatic devices on the steam carriage, with the exception of the safety valve, were removed, including the checks in water gauge. Valves were substituted for these checks and it is impossible to burn out a boiler with the gauge full of water. The ball bearings in the engine were taken out and replaced by bronze bushings, but the balls and cups in the connecting rod were retained. The engine is in need of repair at regular intervals; the piston rings were replaced once. The doctor has had no trouble with the running gear or steering device. He never makes long trips and never required towing home, but uses the carriage in his practice daily.

The doctor considers light steam carriages unsuitable and prefers a strong, simple gasoline vehicle with slow-running, single-cylinder motor. The streets in his section of the city are generally in poor condition and punish a light rig severely.

A second Brooklyn physician bought a light steam carriage (new) in 1900. The driving chain frequently jumped off the sprockets and it was found that the engine was not properly aligned. The rims of the single tube tires were too narrow and cut into the tires. No boiler was ever burned out nor a burner destroyed. The check valves in the water gauge stuck once, but this was discovered in time. The boiler never primes. The gasoline tank has a capacity good for a 35 mile run. The crossbar of the steering device struck the gasoline tank once during a run. A special auxiliary air pump is used. One rear sprocket has been worn out and only two gauge glasses have yet been broken. The fulcrum pins of the valve mechanism wear out too rapidly. The whole vehicle is considered not strong enough, particularly the engine, and this, together with the small wheels and short wheel base, makes the carriage unsuitable for the work of a physician on the streets of a city. The doctor would also choose a gasoline carriage were he to buy an automobile again, and would use only wood wheels and solid rubber tires. The carriage is only used for touring purposes on good roads and is considered of very little use in hilly country because of the brake not being of proper design.

The third physician approached in Brooklyn bought a new light steam vehicle in June, 1900. He had "tire punctures galore," and had many additions made to the carriage, viz.: Automatic air pump, special cylinder oil cup, water heater, superheater, piston rings, tank siphon, automatic oilers for crank shaft bearings and crosshead slides. The doctor had the original burner taken out and has since had two burners of different makes. The last one used has been in since last spring. Three of the original tires have been replaced; both the original and the new tires are single tubes. Accidents of one kind or another have occurred, including the loosening and buckling of the reaches, and the breaking of a chain, which latter will always come off after becoming too loose. The balls and cups of the rear axle bearing were broken and the sprocket on the crank shaft has been renewed. The stem of the throttle valve broke, and so did the brake rod, but no accidents were caused thereby.

This practitioner uses his machine practically every day, rain or shine, and has covered over 5,000 miles so far. The machine is not entirely up to his expectations when purchasing it, repairs being necessary too often. Owing to the frequency of repairs, the automobile is more expensive than a horse and carriage. His automobile he considers too frail, and some of its parts of insufficient dimensions, notably the pipe system; ⅛-inch pipes should give way to pipes of ¾ to ½ inch, in his opinion. Recently a water level indicator (for tank) and an auxiliary boiler feed pump were added. The pipes will be covered next winter. This physician also looks forward to a hydrocarbon vehicle of simple construction.

A colleague of the above mentioned doctor purchased a carriage of the same type and make at the same time. Although this machine was put practically to the same use, in the same neighborhood, where there is no dearth of asphalted streets, this user had little to say in favor of his vehicle and the automobile in general, from the standpoint of a business man or a medical man. The special burner used got clogged up quickly; after scorching a tube he had no more boiler troubles. The engine gave fair satisfaction. The first chain lasted nine months. The reaches loosened, and a solid piece of steel was put in where they telescope. Trouble was experienced in finding a good packing for the water gauge glass; red rubber is used now. The tires furnished with the carriage were soon worn out, and since then "seconds" have been used with good results. These cost only $4 apiece. Twice tanks have become leaky, once the air tank and once the water tank. Three brake rods were broken, and the brake is considered of poor construction. The machine is too frail for him and too costly. Repairs and storage per month amount to $53. The doctor made some 50-mile tours, but finds his "steamer" unreliable. An electric vehicle, with batteries, better than any at present in use, would be the ideal machine for urban use, in his estimation.

The fifth Brooklyn physician interviewed purchased a light steam carriage a year ago, intending to use it in his practice. He made a few tours, covering 150 miles in a single day on one occasion. Tire punctures were of too frequent occurrence, and the wear of running parts was excessive, and he considered the vehicle too dirty and unreliable. It cost him over $60 a month, which is more than two horses would, and required him to get out, make adjustments and soil his cuffs and hands when making calls. The streets along which this user's patients live are either asphalted or paved with Belgian blocks that are in fair condition.

The sixth medical man in Brooklyn that was seen in connection with his experience is an advocate of the automobile. He purchased his first machine in July, 1899, and used it until January 7, 1900. It was a gasoline runabout, with a long wheel base, 34-inch wheels and equipped with a single-cylinder slow-running engine. Something was not true, and the engine clubbed and thumped a good deal. The manufacturer took the machine back and furnished his customer with a new one. This carriage gave some trouble, particularly because the frame was being strained unusually. The source of trouble was soon found in the fulcrums to which the rear springs are attached. These were rather too tight a fit, and were filed up a little. Since then they are oiled occasionally, and there has been no more trouble from this source. No parts show more than normal wear, but the pins running through the flanges of the driver's hub into corresponding flanges require to be replaced from time to time. The foot brake is not very efficient, so that the hand brake is used altogether. The carriage is kept in a special little stable. No man is employed to care for it, and all the repairs that have been necessary have been made

at a bicycle shop. The streets in that part of Brooklyn are exceedingly poor, the sand being from 4 to 6 inches deep, but stones are fortunately scarce. There is only one highway in the vicinity that is in good condition, and there are some steep grades. The doctor's automobile negotiates anything in the way of roads and grades, and is used in the deepest snow; he has no complaint to make, but he remarked that he should prefer a vehicle with a lower centre of gravity, wood wheels and of the appearance of a physician's turnout. In his opinion, there is no such machine on the market.

A physician in New York city who has been using electric cabs in his practice was also interviewed. He claims to be the first practitioner to hire these "clumsy and unsightly" vehicles. The service, as far as the cabs were concerned, was good, but the motormen were negligent and ofttimes intoxicated, and would at times go to sleep inside the cab when the doctor was attending a patient. Cabs ordered by telephone arrived thirty to forty minutes too late, and this time being charged up, as well as the high rates—$1.50 for the first hour, $1 per hour for the rest of the time, and fractions of an hour figured as whole hours—compelled the doctor to fall back on horse cabs for reasons of economy.

A medical man who purchased a heavy single-cylinder gasoline machine for use in his practice on the streets of New York city had some complaints to make. His carriage (1901 model) has wheel steering and heavy (4-inch) pneumatic tires. Two of the latter have already been replaced. One crank shaft was broken. Chains have not given satisfaction, six or seven having been used in as many months. On this make of carriage riveted chains are used, made by the builder of the vehicle. The doctor made some tours last summer aggregating 1,000 miles. His carriage is stored at a repair and storage station controlled by the maker of the vehicle, and although he complains of excessive wear of running parts the machine does the work of two horses in his practice. Towing had to be resorted to twice owing to crank shaft and chain breakages respectively.

The next New York practitioner called on was the contented owner of an automobile of the same make, but of the old lever-steering variety (1900 model). The machine has been used fifteen months, but is not used in the cold season, because it is open. The original tires are still in use. Two chains were broken in use so far. Skidding is excessive on wet asphalt, but less on snow. The only objection raised is in regard to weight distribution. In this user's opinion the carriage would be more readily controlled when skidding if the front wheels carried more of the weight of the machine.

In Jersey City a physician employed an electric runabout of a type using a single motor, in his practice for four months. The first batteries did not give satisfaction and were exchanged for others. Tire punctures represent the only trouble on the road. The machine does the work of two horses in this city of wretched cobblestone streets.

An active practitioner in Jersey City who has given a light steam runabout a trial, having used it two years, found that it would not do in his practice. His vehicle is of the old narrow gauge centre-steering type. After the original tires were worn out he bought six new tires, some of which are in use now. All of the tires are single tubes. A chain lasted this user 1,500 miles. So far three chains have been used. A great amount of trouble has been experienced with the ball bearings of the engine. The safety valve and pump plunger were replaced. Repairs, exclusive of tires, cost $50. Two horses can be kept for the same amount of money as this vehicle. A special burner was tried, but it proved a failure. The doctor intends to look into gasoline carriages of good construction, with a view to purchasing one.

On the outskirts of Brooklyn there are two medical men using automobiles of the same make, a single-cylinder, heavy hydrocarbon machine.

One of them bought a 1901 model, but has not used it making calls, only for touring. His troubles were few, including an occasional puncture, his comparative freedom from tire troubles being explained by the fact that he does not go out much at night, when one is so liable to run over broken glass. The carburetor flooded occasionally at first, but this trouble has ceased. One front wheel is a little out of true, although no collision has taken place. The boiler system is not very efficient and there is excessive evaporation. Oil gets onto the brake wheel at times. The steering device (wheel, worm and worm wheel) has a good deal of back lash. This user would prefer a three-speed gear, that is, an additional gear between high and low gears.

The other physician spoken of lives in the same neighborhood. He bought a carriage of the same make three and a half years ago, it being one of the first twenty carriages built by the maker. It was only little used and was exchanged for a '99 model, which has done service ever since. During this time only one chain was replaced. The tires first used were not very serviceable, the present tires of another make being better. The front tires were originally 32x3 inches and rear ones 36x3 inches, but the present tires are 4-inch. Last spring a crank shaft was broken and a lot of trouble was caused by a needle valve that controls the gasoline supply. A new carburetor of 1901 type was put on recently. The exhaust valve requires frequent grinding and the spring of the admission valve has broken twice. The set screw that secures the steering arm frequently works loose. The doctor does not consider automobiles at present reliable enough. Either two machines are necessary or one and a horse if the practitioner wishes to travel exclusively in his own vehicles and not resort to public conveyances.

The highways in the neighborhood in which these users live are good; the cross roads, however, are generally poor, sometimes sandy and again muddy, a condition to test any automoblie. Although both of these rigs are kept at private stables the cost of keeping them in condition plus the cost of supplies exceeds the cost of a horse and carriage.

A Brooklyn physician who is using a light steam carriage has a skilled mechanic to do his repairing. Asphalted streets are the rule in his neighborhood. He made the purchase in May of this year. The original engine was unsatisfactory, the second one broke its crank shaft, but the third, of a stronger type, is expected to outlast the vehicle itself. The doctor uses the runabout in his practice; he never scorched a boiler nor punctured a tire. The tires used are single tubes, 34 and 36x 2½ inches. No tank or pipe leakages have ever occurred. A special air pump (not automatic) was added, and a special cylinder lubricator was substituted for the original one. Other additions made are a water level indicator and oil cups attached to the caps of the engine bearings. The doctor made one tour of 150 miles. He prefers steam to gasoline for city use and gasoline in the country.

A physician in New York city bought a steam runabout, with which he has covered over 8,000 miles. He has broken only one chain yet, and this happened when the vehicle was stuck in mud. A reserve engine is kept and the machine was used every day last winter. Three gauge glasses were broken; the boiler has never been burnt out, but eight tubes were scorched at one time. Single tube tires, 28x2½ inches, are used. Punctures have been many, and so have refacings, and at present the rear wheels are shod with semi-pneumatics. The rocker arm that drives the boiler feed pump wears excessively in the hub. The automatic devices are satisfactory. Four horses, carriages and a coachman cost $225 per month ($30 per horse). The automobile now costs $7 per month for washing and storing and $8 to $10 for gasoline. The repairs are made at a reasonable price by a mechanic. Formerly the vehicle was kept at the storage and repair station of the makers, who charged $20 for storage and washing per month. The extra bill for repairs amounted to a considerable figure per month. The original burner burned back, and a

new one was fitted, consisting of only two pieces, which gives better results. No trouble has been caused by the running gear, but the (wire) spokes are often broken out in the country. The owner considers that the saving over the cost of horse traction has already paid for the motor vehicle.

Some long tours have been made by this user in his automobile, mostly in the mountains of Connecticut, last summer. In his practice in the city he drives on asphalt pavement practically all the time.

Another young practitioner who lives on the upper West Side purchased a second-hand steam runabout, which had not been used long, and has used it over a year. He burnt out the boiler once, but had it repaired. The checks in the water gauge were removed and valves put in. A reserve engine is kept; steel crossheads are used, which are replaced when they knock. Oil cups have been put on crosshead slides. A hand boiler pump has been added. A steering knuckle was broken when the vehicle smashed into a curb. Spokes are broken frequently. At a speed below 10 miles an hour the feed pump does not pump enough water on account of leakage. Punctures have been numerous and three different makes of pneumatics have been used, all of which were 28x2½ inches single tubes. The dash was removed and a tool box was put in its place. The storage amounts to $20 and the cost of gasoline from $9 to $10 a month. Steam power is preferred by this user to any other.

The doctor does not use his machine for touring, only in his practice where he is not obliged to run on any other than asphalted and macadamized streets. There are some steep grades in that part of New York, but the machine is able to climb them.

FOURTEEN MONTHS' USE BRINGS FULL SATISFACTION.

A physician living in an Ohio city tells how he met with difficulties at first, but finally overcame them and is getting the full measure of satisfaction from his gasoline machine. He says:

About fourteen months ago I first became the owner of an automobile. I had tried the machine time and again along with the agent and nothing could have run better than it did before I bought it, and nothing, I believe, could have done worse than that machine after I bought it. It was a gasoline machine, and, as I learned after I had had it for some time, of an experimental type, and was probably the third or fourth machine of the kind made. I was so confident of my success as an automobilist that I had sold my horses and buggies and intended to do all my work with my automobile. My troubles began on the afternoon of the first day I owned the machine. I went out to make my regular visits and when about 5 miles from the office my auto refused to go. I got out and looked all over the machine, but could find nothing the matter. I put on the crank and turned until I was tired, but it would not start. I telephoned for the agent, and after long struggles I reached home. For the next six months my experiences were about of this order: For a day or two the machine would run as an automobile should, and my hopes would be renewed; then for four days I could do nothing at all with it, and I would be on the verge of giving it up and going back to the horse. But in February the makers wrote me that if I would send the carriage back to them they would rebuild it. I did so, and after it came back it gave me very good satisfaction.

After using it about five months in its new form I determined to sell it and get another machine. I bought one of this year's models of the same make, but a very much heavier and more powerful machine, and, profiting by what I had learned from my first one, I have been able to get along without any trouble and with lots of pleasure. Now as to the

ADVANTAGES OF THE AUTOMOBILE FOR A PHYSICIAN.

In the first place the machine will do the work of the two or three horses that a busy man has to have. It is therefore much cheaper. You can make much better time in your rounds, and this gives time for reading and recreation.

If you have a long ride to make through the country you have the advantage of making better time and you do not feel that you are overdoing your horse.

As to tire troubles, with my first machine I had all sorts of other troubles, but in all the time I ran it I never had a puncture. With my new machine, which is fitted with 2½-inch pneumatic tires, I had trouble with a front tire before I had run over 200 miles. It was not a puncture, but a rupture of the fabric, necessitating a return of the tire to the factory. After running it about 400 miles more the same tire gave way again in the same place.

LARGER TIRES RECOMMENDED.

I am satisfied that for use over crushed stone pikes or over streets where the street car tracks are laid as they are in my city larger tires than the 2½-inch would be better.

My advice to a physician about to buy a machine would be this: Buy a machine that has been made and used long enough to be out of the experimental stage. Buy one heavy enough to stand the roads of this country and with power enough to take you any place where you want to go. Then learn to run it yourself. Study its weak points and learn enough about making repairs so that if anything breaks on the road you can patch up and get home. With proper care and a good machine it is just what the physician needs to make his work both pleasant and profitable.

AUTOMOBILE WORTH MORE TO HIM THAN A BARN FULL OF HORSES.

Such is the emphatic verdict of a Michigan doctor after six months' continuous use of the automobile in his practice.

I have a 7 horse power double cylinder gasoline motor with one seat and leather top, weighing, with tanks filled, 1,750 pounds, which I have run continuously on city and country roads since the 1st of June last. Before that I used two horses to do my work, but I sold my horses on the start. I have had no trouble since to do all of my work, besides a good deal of running about for pleasure, and I can do double the work I could do with the horses. I have not found any roads so bad that I could not get over them faster than with a horse, and I will say that I have been over roads that I would hesitate to drive a horse and carriage through. I can make 12 miles an hour on ordinary country roads and never had a breakdown yet so bad that I could not get home all right. I use the make and break spark and a carburetor of my own make which works perfectly. I have used it in the coldest weather this fall without taking any hot air and have had no trouble in starting or running it after it is started.

I use two Vesta storage batteries, one for sparking and the other for an electric headlight which lights up the road 50 feet ahead. I have it so arranged that I can switch this battery onto the sparking circuit if the sparking battery gives out, which has happened only once while in the country, but even on that one occasion it was worth more to me than the battery cost. The battery will run the machine 500 or 600 miles without recharging.

As to wheels I have 32-inch wooden wheels, with 2-inch Kelly solid rubber tires, which show no wear yet. My auto rides easy and so far I have had no trouble with skidding on country roads. The tires follow in the wagon tracks and never get stuck or wedged into ruts, which could not be done with 3 or 4 inch pneumatic tires. My wheels have roller bearings both front and rear, which I think necessary on all rigs weighing over 1,000 pounds.

As to steam automobiles I have had no experience, but from what I have seen of them I prefer the gasoline by all odds, both for economy, reliability and safety. As to the weight of my machine I do not see where I could make it any lighter with safety. As to power I think 8 or 10 horse power would be more satisfactory in deep sand or mud, for with a 7 horse power I have to change onto the slow gear more often than I would if I had more power; but on all ordinary roads I am satisfied with 7 horse power. I have never found a hill or place so bad that I could not pass over it without difficulty

BOLTS AND NUTS.

If I should ever order another machine I would insist that every bolt below ¼ inch should be made by lathe from an-

nealed steel, with extra thick cold punched nuts, with set nuts or split pins or both. The iron used in carriage bolts is all right for the purpose for which they were made, but it has no business in an automobile, and as for carrying around a half-peck of bolts and nuts in case of a breakdown, it is not necessary if the right material is used on the start. I have now practiced medicine thirty-five years and in that time have owned a great many good horses as well as some poor ones, but I would not trade the automobile for a barn full of horses for my own use. I admit that I am an automobile crank at present and hope to remain one the rest of the time that I may spend in the practice of medicine or any other vocation, and further, I believe that if a man is sober and does not lose his head the automobile is safer than the horse. I have frightened some horses, but have never caused a runaway or serious accident yet, and with a little care and judgment trouble from this source can easily be avoided.

Such is my experience after six months' everyday use of an automobile.

HAS TRIED ELECTRICITY AND STEAM.

A St. Louis physician writes:

Two years ago I purchased an electric automobile of a Chicago manufacturer. The carriage is of the Stanhope type. I have used the machine in my practice and also for pleasure riding almost continually since that time and have never regretted having sold my horses, as the carriage has been less trouble and, I believe, no more expensive to keep than the horses.

I have had some trouble with batteries. The first set was of the Plante type, and I was never able to get the required 25 miles out of them. I am now using a set of batteries made in St. Louis, which for the first three months gave me as much mileage on one charge as I required (about 25), but lately they have been failing, and as the concern that furnished them has also failed, I shall have trouble in getting them to make good their guarantee of keeping the battery in order for three years.

I have recently purchased a "White steam carriage," and after several weeks' constant use I feel as if I now had the ideal automobile. It generates steam very rapidly, quicker than any that I have tried, and is a very good hill climber, and in our city that is of great importance, as we have very few level streets.

I have had no experience with gasoline carriages, but believe I would prefer the steam vehicle on account of its being less noisy; in fact, the noisiness and the vibration of the engine have deterred me from buying the explosive engine type, which has many things in its favor. For a physician in general practice I think one great advantage that the gasoline carriage has is that it is ready to start at any time without first having to light a fire. A disadvantage is the necessity of first turning the crank after every stop before starting for the next visit, and manufacturers ought to try and invent some arrangement to make this unnecessary.

A COMPARISON.

In comparing steam and electric vehicles for physicians' use I have this to say: A physician should have two vehicles, one electric and one steam, the first to be used for emergency calls and short distances, and the latter for making his regular rounds and for long trips into the country, etc. The advantage of the electric vehicle, always ready to start out (that is, if the owner's barn has the proper charging facilities, which it should have), is self-evident. Another reason why he should preferably have two vehicles is that the electric, or for that matter the gasoline machine, will give better service in very cold weather, there being no danger of the machine being ruined by freezing. If he is living in a warm climate this latter trouble is, of course, not to be feared. If the physician can afford to buy but one vehicle I would advise him to get steam.

In my opinion the flash boiler is the boiler par excellence for automobiles. There is no water glass to watch, and with the water tube construction no danger of burning out the tubes or of exploding.

SOLID TIRES.

In regard to tires I will say that if the manufacturers would furnish us with solid 3-inch tires they would be preferable to the pneumatic variety, because we would be rid of the fear of punctures, and I believe they would ride almost as easy as the latter. My objection to solid tires is that they sink into the soft road too deeply, as they are too narrow. When wider they would also have more resiliency.

To sum up, it is my opinion that the automobile is the ideal vehicle for physicians, and I feel sure that the time is not far off when, for city use, the horse will be abolished by them in their practice. When we get better roads in the country our brethren there will also want them.

"AFTER MUCH TRIBULATION."

Here is a Massachusetts doctor who is just such stuff as successful automobilists are made of. He had his trials, as all have, but he persevered and is now enjoying the fruits of his experience:

After having used horses in my medical practice for ten years I became interested in the automobile as doing away with the great expense of keeping teams, the bother and disagreeable features of drivers, etc. I subscribed for the three leading automobile journals, sent for a catalogue of every vehicle I saw advertised, attended every automobile show I could get to, and finally pinned my faith to steam as the best power for my business. The first of April finally saw me in possession of a steam carriage of the latest construction. Ready for anything and on the point of selling my teams—so sure was I that the automobile was the proper means of locomotion for a doctor. My experience with steam had all been on paper, my knowledge of it being derived entirely from catalogues and journals. So after fixing up after a fashion I started out and ran quite a distance very successfully. Then, wishing to appear before my family as a full-blown chauffeur, I started for my residence, just in front of which I began to smell gasoline. Jumping out I discovered that the fire had been out some time, and that the machine had been squirting clear gasoline for five minutes. Without stopping to think, I pulled out a match and attempted to relight the fire—piff! bang! and the whole thing was ablaze. I retained presence of mind enough to turn off the main gasoline supply and to throw out the cushions and throw mud and dirty water from the street at it until I had subdued the flames, but my $800 auto looked like a bad case of delirium tremens: the paint was scorched and the machine covered with mud, my clothing was dirty and soiled and my reputation as an expert shattered the first day among all the neighbors, who, as usual, witnessed the accident.

This first experience rather put a damper on my enthusiasm, at least for two or three days, but when the machine had been washed up it looked somewhat better, and after much persuasion I induced my wife to accompany me on a short spin.

After we had ridden out about a mile from the city I suddenly missed the water.

THE FUSIBLE PLUG

blew out and my boiler was burned. Now I was simply going to shine! I explained how this could easily be overcome, for (according to the catalogue) all that is necessary is to insert a key where the fusible plug was, pump up the water by hand, and go rejoicing on your way. Spreading a robe on the ground I proceeded to put my printed instructions into practice; but, alas! I found the key would not fit in the opening, as the babbitt metal stuck to the sides and the tubes were leaking badly. So with fingers burned and clothes soiled and disordered I was again towed home in disgrace, and here I learned my two first lessons in automobiling: First, don't believe over one-half you read in the printed catalogue; second, never wear a silk hat, frock coat and white linen on an auto trip; they don't look well after an accident.

After getting my boiler tubes expanded, in the course of two or three days I was again ready for business. About this time the Massachusetts Automobile Club had a run of 20 miles and I started well up in the front and kept a pretty good gait, but in going down a steep hill my tension

rod worked loose and the chain rode the sprocket. In trying to stop

THE TENSION ROD

was broken, and I had the pleasure of seeing everything go by me except the repair wagon, which stopped, and by placing a couple of slats alongside the rod and wiring it all together we arrived at our destination one hour late for dinner and the speeches.

After an uneventful ride home I soon had a new tension rod made and my carriage ran well for about a week. Then

THE TOURING FEVER

again got a hold on me and I decided to visit the historic old town of Plymouth, 18 miles distant.

It was a beautiful morning, clear and crisp, no wind, and an ideal day for an automobile trip. The first 8 miles were made in fairly good time, but in going up a sandy hill

THE FUSIBLE PLUG

blew out with half a glass of water in the gauge. I pushed the machine into a farmer's barn and returned to my home after walking 2 miles to an electric road. Next day I went with a mechanic to repair the boiler, which we soon accomplished, and completed our trip to Plymouth, arriving in good shape.

On our return we encountered some rather sandy road, and it was getting pretty dark. Not being used to night running we were forced to go rather slow. I jumped out of the carriage, looked at my water glass, which showed two-thirds full, took my seat, grasped the throttle and away we went, but had not proceeded over 20 feet before our

BOILER BURNED OUT AGAIN.

So we again pushed it into a cow shed for the night. Here we were 8 miles from home at 9:30 p. m. in the most forsaken country on earth, with no telephones, no trolleys, no livery. After rousing several farmers we engaged one who was willing to take us home for $6, which we cheerfully gave. We arrived home at 12 at night.

Two days later we hired another team and returned to our stranded ship. We expanded our tubes and discovered what had been the trouble. The upper check in the water glass had become rusty and did not work, and this resulted in a false indication of the water glass. Both checks were removed and I have had no difficulty with false gauge readings since; but I have seen a great many boilers burned on account of the checks sticking or working loose and nothing could induce me to have them again placed in my wagon. It is a very easy matter to reach down and shut off the hot water to the gauge glass and then the steam should the water glass break.

We started home at 7 p. m., and after a mile or so it began to rain, and, great Scott! how it did come down. We stuck to our post, however, as we were bound to get the wagon home. But something now was the matter with the engine. We could just barely go along at 7 or 8 miles an hour when we wished for our best speed. At 9 p. m. we arrived home, not a dry thing on us except our collar buttons. Here was a record: A trip of 36 miles in three days, boiler burned out twice, hired two livery teams, and had a ride home at night in the rain.

My auto enthusiasm had now somewhat abated, and I left the machine in the stable for a week and sent to the factory for a man to look the engine over. After two days' work he succeeded in getting me going again, and for two weeks everything went very smoothly. I used my machine afternoons in my business and got along very nicely.

My next trip was to Providence, 36 miles, which was made in excellent time, and we were just congratulating ourselves on our successful run when we ran over a stone and

BROKE THE REAR AXLE.

We were towed into the city with a beam for a rear wheel. My next trial, on the way home, was a punctured tire.

Since then my

TROUBLES HAVE CEASED

and I am enjoying the machine more every day. From my experience I am convinced that the axles on the majority of automobiles are not strong enough, and this was shown quite conclusively by the New York Endurance Run; also that check valves should not be used on the water glass, but an arrangement whereby the steam and water can quickly be shut off from the glass in case it breaks. Have a good free circulation from boiler to the glass. Next, I should favor wood wheels with semi-pneumatic tires, if not too stiff. Because a physician does not always pick his routes he is compelled to go down some pretty bad streets, where bottles, broken glass and nails are as common as dirty children. Then a suitable pilot light is indispensable, one that the wind cannot easily blow out. For a physician I think a light gasoline runabout, one that you can start quickly and that is ready at any time, day or night, is the most practical machine. Of course, the noise arising from the explosion of the fuel in the cylinders is an objectionable feature, but this is being rapidly overcome.

I am fairly positive that a physician with a large practice cannot entirely do away with the horse, but those who keep two or three horses can with one horse and an automobile accomplish the same as with three or four horses at much less expense.

To one who has ridden 16 or 18 miles an hour over nice, smooth roads, without jolting, noise or jumble, the pleasure of the automobile appeals most strongly, and while I personally have had a great deal of trouble and costly experience I feel satisfied that it is

THE COMING MEANS OF LOCOMOTION,

and soon every well equipped physician will recognize its usefulness and will possess one—or more.

FROM STEAM TO GASOLINE.

A Boston physician describes his experience with the automobile as follows:

In October, 1899, I purchased a steam carriage and used it in my practice whenever it was in condition to run, until April, 1900, when, after having it put in thorough repair and repainted, I sold it. This carriage I found to be too light in construction for city use, as the constant running over the pavements jarred it so much that it was necessary to send it to the repair shop about every week. From my experience with this carriage I concluded that a steam carriage was not suitable for a physician's use for the following reasons: In case of an emergency call it takes too long to get up steam; a physician's carriage should be ready to use at a moment's notice; the steam carriage requires constant attention on the part of the driver to be given to the various gauges, to the fire, water, etc., which becomes a great annoyance when he is running his carriage himself. If a physician is to use a steam carriage he should have a man who understands the carriage perfectly run it for him, or at least go with him, so that when he leaves the carriage to treat a patient he is not worried about what may happen to it. The danger of fire is also a great objection to the use of the steam carriage. The liability of freezing in winter makes the steam carriage of no use at that season of the year, for the physician may be called to go out at night and be obliged to leave the carriage standing for four or five hours out in the street with the weather perhaps at zero.

Being convinced that the steam carriage was not satisfactory for my use I purchased in April, 1900, a gasoline phaeton. This carriage proved more satisfactory than the steam, as I could use it at all times and in all kinds of weather; but it was liable to get out of order on the road and required much tinkering to keep it in running order. It was often necessary to work for an hour or two fixing some part in order to reach home. The inaccessibility of all its parts made the repair bills very heavy. It sometimes required from a half to a whole day to take it to pieces to reach some part which required repair. The constant dripping of oil made it very dirty to run. It was especially annoying when dressed to enter the sick room to be obliged to spend from half an hour to an hour on the road adjusting some part of the mechanism of the carriage and in so doing get hands and clothes covered with oil and dirt. However, by wearing a leather coat and taking my overalls along I was enabled to use the carriage nearly every day last winter. Once I was called at

1 p. m. and left the carriage out of doors until 7 a. m. with the weather at 10 above zero. The engine started at the first turn and brought me home. I used this carriage until July, 1901, and was never unable to reach home but once. I

RAN THE CARRIAGE ABOUT 5,000 MILES,

and with the above exception it always came home by its own power.

TIRES.

On all my carriages I have used single tube tires and have had very little trouble with them, averaging a puncture once in about 2,000 miles. I have had no experience with double tube tires on automobiles. I used them on a horse carriage and had considerable trouble from the tire creeping on the rims, and later the water got in and rotted the fabric from the wires and the tire blew off.

In July, 1901, I bought a lighter gasoline carriage and have run it about 3,000 miles since with almost no expense for repairs. The moving parts being inclosed in oil-tight cases makes this a very neat and clean carriage to run. This carriage I have run nearly every day since July from 15 to 100 miles a day, with very little attention except to change the oil and fill up with gasoline and water, with an occasional adjustment of the vibrator or sparking plug. During August I was at the seashore running the carriage over sandy roads and back and forth to the city twice a week, besides running round the city making calls. The distance from my office to my residence at the shore was 37 miles.

CONCLUSIONS.

From my experience I should say the jump spark is very much more economical as to batteries than the contact spark. It seems to me that the ideal carriage for a physician should have three speeds and a reverse—a low speed capable of climbing any hill, a middle speed of 10 to 15 miles per hour, and a high speed of 30 miles per hour. The engine should have power to take all ordinary hills on the middle speed and the high speed should be used only for short distances over good roads. The carriage should be capable of running in all weathers and should have storm boot and curtains or glass front to protect the passenger from the storm. The engine should start easily, as the physician, if he uses his carriage in making calls, must stop and start it many times a day, or else leave it running while he is in the house, which is hardly a safe thing to do. The carriage should have long, easy springs and very little vibration, for the physician spends a very large part of his time in it. And above all, it must be reliable, of a weight not exceeding 1,000 pounds, or at least not much exceeding it; air cooled if possible, or at least not liable to freeze easily.

USES AN AIR-COOLED THREE-WHEELER.

Living among good roads the subscriber who favors us with the following recommends the three wheeled construction. He is not so sure about the air-cooled motor:

My experience with the automobile covers a period of five months only. I have had my troubles, as everyone must expect to have, but I have only once been put to the ignominy of being hauled home by a horse—a broken sparking plug when I had accidentally left my extra one at home.

I live among some of the best of New Jersey roads. Our important ones are all good macadam, the others mostly good gravel, a few are deep sand. We have no hard hills, so a machine which will give good service anywhere should do so here.

I pinned my faith in the beginning to a gasoline engine, and from watching my friends' experience with steam I have as yet had no reason to regret my choice. My machine, when it is in order, is always ready; no fire to light, no boiler to fill, no gauges to watch. I run it out of the stable, turn a crank and I am off. When I stop for a call I have no anxiety about fire, water or safety valve; the whole motive power is as dead as when in the stable and I do not have to give it a thought. On the road as long as the accustomed pulsations of the engine beat on my ears I know everything is all right and I do not feel that a slight inattention while I am pondering over a case of pneumonia or appendicitis may result in a burnt out boiler.

Whether my particular machine is the best for general use I will not undertake to decide, but it has several strong points which have made it, taken altogether, quite satisfactory so far, especially for a beginner. It is a three-wheeler, with an air-cooled motor. One of the strong points is the comparative absence of noise—for a gasoline machine. It is important for a doctor's practice that he shall not make himself a general nuisance in the neighborhood, and to my mind the noise made by some of the otherwise first-class machines is such that I would not even consider the purchase of one. For practical purposes it matters little how much noise you make while running at high speed on a clear road, but the important point is the ability to run very quietly when slowing up to pass a nervous horse. If a machine will do this I think it is all we can reasonably ask, and except on a hill or in deep sand this my machine will do. This has practically eliminated horse troubles in my experience and has added greatly to my comfort of mind.

ADVOCATES THE THREE-WHEELER.

I have become a strong advocate of the three-wheel construction. It allows of shorter turns, lessens strain on the running gear, gives a neater appearance to the carriage, takes away the horse-wanted appearance, eliminates one-quarter of the tire troubles, and, contrary to my expectation, is very easy to manage even among ruts.

Of the success of the air-cooling feature I am not so sure, though it has the merit of simplicity. Most of the few troubles I have had have come from overheating of the engine, and should I purchase again my present preference would be for a water-jacketed motor.

As to the practicability of the automobile for a physician, I would say that in a country where the roads are reasonably good it is a most welcome addition to his facilities for transportation, but don't sell all the horses yet.

When the machine is all right it makes a hard day's work easy; it gets one home in time for meals, relieves the sense of hurry and rush, to say nothing of the pleasure of running it, and makes life altogether more agreeable. But, alas! the evil days come when the only mechanic who knows anything about your machine is miles away, in the city, and your country bicycle repairer is "floored." Then you are glad you have still kept your horses.

AN IDEAL CONVEYANCE FOR A PHYSICIAN.

Another Milwaukee physician writes of a similar enjoyable and profitable experience with a gasoline automobile:

I have been an enthusiast on the automobile subject ever since the early summer of 1899. That I might make a sensible choice of power I decided an up to date journal would furnish the desired information, and after getting sample copies from several publishers, decided to subscribe for THE HORSELESS AGE. After a careful study from this source, I came to the conclusion that of the three powers a gasoline engine represented the most economical and easily managed power. I further decided that the simpler the mechanism consistent with good working qualities, the less trouble I would have; so I finally bought a machine having a single cylinder Otto cycle water jacketed gasoline motor, the whole rig weighing about 600 pounds. The ignition is of the jump spark type, fed by four Columbian dry cell batteries, of which there is an extra set in reserve, the switch being so constituted as to turn on either set, making it nearly impossible to get stuck on the road for want of electricity. I haven't, at any rate. I have never used the wipe spark, but do not wish anything better in the ignition line than what I have. The expense is not more than a dollar in two months, which is the price of one set of batteries. Neither have I used a carburetor; the gasoline in my engine is pumped by a diaphragm pump through a needle valve to the mixer, and what is not evaporated and used flows back into the tank. The diaphragm of the pump is operated by the vacuum produced by the piston in an air-tight crank case. The pump reaches to the bottom of the tank, thus using the heaviest grade of gasoline in the tank at all times. By the working of the engine this seems to be a very reliable and economical arrangement

About 5 gallons of water is carried and kept in circulation by a rotary pump. Most of the water is in radiating coils under the footboard, though there is a small tank directly above the engine. This system needs very little attention and the water needs an addition of about two quarts every 25 miles.

I don't know whether it is my ability to operate the rig or the superiority of the rig itself, but I have had no exciting experiences. The engine has refused to work in only three instances, twice owing to a small amount of dirt clogging the needle valve and preventing the flow of gasoline, easily remedied in a few minutes as I was not long in locating the trouble. The third time I was stalled it was due entirely to my own fault. I had washed some varnish out of a small paint brush in a bowl of gasoline, and thinking there was no use in wasting the gasoline I threw it back into the can. Some of the varnish finally reached the inlet valve and stuck fast there. The valve does not depend entirely on a spring, but is opened by a short lever operated by a small cam on the same shaft as that which operates the exhaust valve. If it had been a spring operated valve the engine would not have run at all. The valve stuck more or less for about a week. Every time the engine got cold I would have to loosen the valve with kerosene. I forgot to loosen it one morning, however, and in trying to start the engine broke the small lever mentioned above. I was 25 miles from home, but with the kindly aid of a blacksmith I got the lever patched up and had the machine running in about an hour.

I have pneumatic single tube tires and have very little trouble with them. I had one puncture caused by a tack. As long as it remained in position the tire did not leak, but when removed the air began to whistle out, so I replaced it in the tire and proceeded to a bicycle shop. After paying the bill and returning home I found I was in about as bad shape as when I started, so I got some rim cement such as is used to cement bicycle tires on with, and then getting a Morgan & Wright quick repair outfit forced some of the stuff into the puncture and the tire has not leaked since. It is needless to say that I keep that outfit in my tool box.

I will not say that I can climb any grade here in Milwaukee, but I have not been stalled on any hill that I have attempted and I usually get up ahead of the horses.

I think a rig of this sort should be kept in a warm place during cold weather so as to be always ready to start. I find I have to give it a supply of warm water when the engine is thoroughly chilled through. After I do this I have no trouble starting at any time.

If there is any secret about running an auto it lies in keeping things well oiled and everything right and tight. The expense is far under what it would cost to keep a horse, even if a horse could do the same amount of work. One would think there would be considerable vibration to a single-cylinder engine, but it is hardly perceptible when running on ordinarily smooth roads and the engine is well muffled. Horses notice it some and occasionally one will act a little fractious, but I haven't any damage suits on my hands up to date. I am very much pleased with my rig and think it an ideal conveyance for a physician, one that will keep a good pace and never get tired. I would not trade it for the best team of horses that ever existed for my own use.

LESS THAN THREE CENTS A MILE.

Living in a suburb of Philadelphia where roads are excellent the writer of the following has had a most satisfactory experience with his gasoline machine. The table of costs which he appends should influence the doubting physician to add the new locomotion to his stable:

In regard to your request for doctors' experiences with automobiles I would say that I began to use a light gasoline carriage in November, 1900, which has given most satisfactory results. As to cost of maintenance the enclosed data will show you the bearings of the question from that standpoint. So well satisfied am I with my experience that I am now driving a second carriage recently built for me by the same manufacturer and embodying many improved details. Success with an automobile depends on the care one gives it, and in the case of a busy doctor it is most important to start with the idea that he must have an intelligent and instructed man to give the proper attention to a machine from which he expects so much. Many of the troubles of an automobile, more especially of the gasoline type, are merely matters of disturbed adjustment, which with acquired diagnostic skill on the part of the driver may be promptly corrected on the road. Given a district with good roads, such as we have here, the drudgery of a country doctor's life is in a great measure lessened, at least I can truthfully say this has been my own experience.

STATEMENT.

Expense of operating a light gasoline automobile from November 26, 1900, to October 1, 1901:

Distance covered	6,000 miles
Distance per day (including Sunday)	17.7 miles
Fuel (gasoline—202½ gallons)	$30.99
Lubricating oil (6 gallons)	3.55
Waste (4½ pounds)	.43
Ordinary repairs	1.3831
Due to accident	44.30
Total	$162.17

COST PER MILE.

	Cents Per Mile.
Fuel	.5165
Lubricating oil	.0592
Waste	.0071
Ordinary repairs	1.3831
Due to accident	.7383
Total	2.7042

BUYS A SECOND-HAND RIG FOR EXPERIENCE.

An Illinois doctor who has been experimenting with a second-hand rig writes:

I have used my rig sufficiently to form some idea of its usefulness. I am located in a rural district, on a small river, and have quite a number of hills to climb.

After spending some little time looking up rigs, I finally went to St. Louis, and after using a gasoline and a steam rig, concluded that they were not just what was wanted for rural use. I therefore bought a second-hand steam rig for experimental purposes. It was as good as new and I have run it over 600 miles without the need of any repairs, but there are certain improvements which have suggested themselves.

LARGER WHEELS.

First of all, the wheels are too small for country roads when rough and muddy, making it necessary to run very slowly on account of the vibration. This takes too much of the doctor's time, especially inasmuch as a doctor's harvest is when the roads are bad. I believe that if the wheels were not less than 40 inches in diameter and as much larger as the manufacturers might make them, they would overcome a great many drawbacks. On hard roads or paved streets it doesn't make much difference, but the large wheel would go through mud much easier, and would prevent a great deal of skidding, which is at present a very bad feature, as was noticed in the Endurance Run.

WHEEL BASE TOO SHORT.

I am also convinced that the wheel base is entirely too short to give the best results on all kinds of roads. It ought to be twice the length.

The frames on most of the steam runabouts are too light for country roads. They bend very easily and soon throw your machinery out of line. A good solid frame is very desirable on country roads. The tires on my rig are 2½-inch pneumatic single tubes and do not show a scratch. They have run over 600 milles and have not been blown up since I started the rig. For dirt roads, and especially if one expects to travel on them when they are rough, rutty or muddy, a solid 1½-inch would be preferable, because the ruts grind the sides of the larger tires and they would soon give way. The speed of some rigs is too high for practical use.

SLOWER SPEED

would be much better and give more power on rough roads and be much better

to handle. Twenty miles an hour should be the top; and I believe if a doctor had a rig that would take him over the country roads from 10 to 15 miles an hour you would not hear him complain of speed.

Of course I am speaking of the practicability of the machine as a doctor's conveyance. With a larger wheel, a longer wheel base, a heavy frame and slower speed—between 15 or 20 miles an hour (rig to weigh between 1,400 and 1,600 pounds)—either steam or gasoline would make a rig capable of doing the most of a doctor's work in the country satisfactorily. The present steam rigs are all right on hard or paved roads or good dirt roads, but on muddy roads they are not satisfactory for a doctor's use. They will go through, but so slowly and with so much adjusting and filling of water tanks that it takes too much time for the ordinary doctor.

If the care of the rig is to fall upon the doctor himself it requires a good deal of attention at the barn to see that all nuts are taut, joints oiled, packing good, etc. I keep my rig ready to fire at any time, and in seven minutes after I receive a call am ready to go, and it never tires; ready to go any distance and return at same speed and ready for another trip. I keep horses for the muddy roads. I have never been detained along the road a minute by my machine from any cause pertaining to the machine. It is a fine hill climber as long as there is not much mud. My

REASONS FOR SELECTING A STEAM RIG

in preference to gasoline were that the steam rig was a better hill climber, made less noise and was simple to run, allowing of all kinds of speed, always under perfect control of the operator. There are some drawbacks to a steam rig for a doctor over gasoline, chiefly in starting. A gasoline rig is ready to start at once, providing you have all of your valves properly adjusted, and the steam rig requires lots of water, but the smoothness with which the steam rigs move overcomes this objection. For after you once have steam up you don't have to ask any odds of a gasoline rig.

Another advantage the gasoline has over the steam rig is its use in winter. A gas rig could run right along, while the steam rig's pipes would be frozen up, unless they were packed.

Endurance Run Conclusions.

By Dr. Daniel Longaker.

I have now driven my first and only motor carriage about 10,000 miles and I have naturally reached some conclusion regarding both carriage and motive power.

Those relating to the former may be briefly considered under weight and running gear. While at first sight it seems absurd to drag around a vehicle weighing nearly a ton and designed to carry only two persons, I am convinced for touring on roads such as we are likely to encounter for some time to come weight is a distinct advantage.

Nothing could have been more satisfactory than the success with which we negotiated mud and grades in a trip to Pocono and the Delaware Water Gap during the past summer. This tour was made during the August rains. We passed through miles and miles of heavy mud, occasionally sinking in deeply. The worst conditions were encountered on the return from the Water Gap to Philadelphia, and especially between Riegelsville and Doylestown. It was nothing but mud, even on the grades. A heavy rain had poured down a few hours ahead of us. Yet the entire distance from the Gap to Philadelphia, 88 miles, was made in 8 hours running time. Surely a satisfactory performance under even good conditions.

Driving over hard streets, uneven street crossings, rubble pavements which in places have not been relaid for a few years and are subjected to heavy traffic, rising and sinking in undulations, the problem is different. I may be guilty of driving too fast, for I am frequently experiencing shocks and occasionally breaking springs. During the last four months I have broken as many blades on three of my four elliptical springs. Three of the breaks were in front.

These shocks are also telling on my front tires. Recently the outer covering of one split and peeled off in two places and they have been in use two months less than the rear ones. (All are Diamonds, 3-inch front and 4-inch rear; the latter have covered 5,000 miles and look good for as many more.)

The most serious result from driving over this peculiar wavy pavement was a fatality to a steering knuckle. It broke off just within the hub and let that slide down with a suddenness that almost threw me over the front, bent the axle and the other steering knuckle as well as both halves of the rear axle and the rim of one rear wheel.

Perhaps less weight would result in less damage from the peculiar pounding incident to driving over hard, rough, wavy streets at even a moderate pace.

RUNNING GEAR.

I believe the type of running gear the carriage men consider satisfactory is capable of large improvement. Mine has distance rods or reaches between the front and rear axles. These have rarely been free from rattle; are unsightly and collect dirt. I believe they should be abolished and springs be so arranged as to absorb the shocks incident to the forward drive, giving some flexibility and yet having sufficient rigidity. I believe some machines of foreign type could be driven against a stone wall without suffering seriously; they have no reaches.

TRANSMISSION.

A word about the transmission and I shall have dealt with every serious fault from the standpoint of my own experience.

The bi-concave disk friction clutches are satisfactory, save that they require refacing or dressing every few thousand miles. This involves an expense that should be avoided by some better and more permanent device. All countershafts should be abolished. Gears active and idle, running in mesh constantly, are noisy even when well lubricated, and they require power and wear out. So far, I have not been obliged

The Stevens-Duryea Motor Carriage.

The Stevens-Duryea Motor Carriage.

The J. Stevens Arms and Tool Company, Chicopee Falls, Mass., are putting in a large amount of new machinery preparatory to getting out the J. Frank Duryea gasoline automobile. Castings for fifty machines are on the floor and twenty-five men are already at work. The first lot of machines will be ready for the market in March next.

The automobile now being built, which will be known as the Stevens-Duryea carriage, will be equipped with a 5 horse power double cylinder, horizontal motor of the four cycle type. The transmission will be by gearing, giving three speeds and a reverse. Intermediate speeds can be secured by throttling the lever.

to replace a single one, and I have never stripped one, but all show wear.

The countershaft over the rear axle, driving through a spur gear, has gotten me into serious difficulty. Compensation is through bevels, lateral ones above and below. The side bevel gears are fixed to the axle by set screws which work loose; the top and bottom bevels are fixed in a frame by screw bolts which likewise work loose, unscrew and finally project so far as to strike the frame in their revolution. When this occurs there is likely to be a pretty extensive smash up in the differential. I had one such accident. Luckily it occurred on a slight grade and not on a hill, for neither of the two brakes had the slightest effect in stopping the wagon afterward. This emphasizes what you have so frequently insisted on.

THE NEED OF EFFICIENT BRAKING.

There must be a brake acting on the wheels directly and not through a chain or gears! As I mentioned in a previous communication this peculiar accident occurs not infrequently. There were two others of precisely the same character at the time I wrote. I have personally heard of another since. Perhaps some I did not learn of. Its causation was a mystery not clear to either myself or to the man who made the repairs. He could not enlighten me. I think he did not know, for he put the parts back in exactly the same manner and it was only on my vacation tour that I found out how the part was damaged.

One hundred and twenty-five miles away from home, a range of mountains to be crossed and a machine that might at any critical moment run wild. In such a wagon the two supports of a large and dependent family of children had to return. The thought gave me more than one nightmare. By getting down under the machine into the grime and dirt several times daily and tightening the faulty mechanism I brough all home safely. Since then two pieces of sheet steel, with an end fastened to the revolving yoke and secured to both bolt heads by cotter pins, have given some security. I still feel that this part requires occasional removal of the gear case and careful inspection.

MOTIVE POWER.

In speaking of the engine I would be unfair to use other than words of praise.

My 8 horse power gasoline engine can be relied on absolutely. It has continued to work all this time without once faltering or balking. It is perhaps better than ever. The only repairs it has required were a new exhaust spring and a new inlet valve. The exhaust cam did not quite suit our fancy, being somewhat worn, so it was replaced by a new one. The new inlet valve stem is held to the gasoline needle valve more rigidly by a longer nut and is not likely to break soon.

A broken inlet valve necessitated the single and only tow I have ever had from the failure of the engine itself. In cold weather or in hot, rain, snow or shine I can depend on getting home every time with certainty.

IGNITION.

Ignition is by contact and I have added a variable spark. The latter has distinct advantages. No back kick is possible in starting the motor if the spark be set late. It makes the power more flexible and is of distinct advantage in climbing hills.

The dry cell has been discarded. I found it unsatisfactory for the contact spark. Its use necessitated frequent dressing of the points. About every 100 miles the plug would have to be removed and this was a nuisance. The points soon wore out, necessitating renewal, but most important was the expense. In six months I spent a little over $25 for dry cells. Six in circuit worked admirably for a short time, but their life was very uncertain and always limited. A trip to Atlantic City and return, 120 miles, exhausted one of these batteries. My experience confirmed the unreliability of the dry cell for automobile work. Dealers had uniformly failed to recommend them.

One of my friends, using a machine similar to my own, in a conversation told me he was thinking of having his ignition changed to a jump spark. He was and is still using the same dry cell. Thinking my coil might be at fault I bought and put in service a new one.

It is short and holds 6 pounds of wire. This made not the slightest difference. Finally I put in eight wet primary cells, type Z, with no change in the wiring whatever. A wonderful improvement was soon manifest, the power of the engine increased and remained uniform for hundreds of miles. Whenever the plug was removed but slight roughness of the points was observed and their contact was still good. One charge has carried me 1,400 odometer miles, including tours over heavy, bad and mountainous roads, and it still fires well. For about 200 miles the instrument did not register, thus I shall be able to get about 2,000 miles out of one charge. It costs about $5, a remarkable saving, and the improved results in operating are even more remarkable. Day after day my engine develops its full power uniformly. The needle valve has required but one adjustment in 1,000 miles and this occurred a few weeks ago with the advent of cold mornings. The firing was bad, the exhaust smoky, due to a flooded carburetor.

ENGINE ABSOLUTELY RELIABLE.

I repeat this type of engine can be absolutely depended on. That it requires no skilled engineer to operate it is clear when a fifteen year old boy can drive it 36 miles out into the country over hills and bad roads such as we have between Philadelphia and the vicinity of Pottstown. This was done by my son on a recent Sunday afternoon and without a stop or single mishap and in three hours and a quarter.

After resting a few hours the homeward trip was made by myself in exactly three hours. In the morning of the same day I had driven about the city 10 miles, a total of 82 miles on one Sunday, undertaken without any special attention and after I had made a daily average of 20 miles for six weeks.

On the following day I resumed my daily runs of the same average distance and continued them until the unfortunate accident to my axle interrupted the splendid record. I have little or no doubt that I shall duplicate this record again and again when repairs are made.

ECONOMY IN OPERATION.

Four gallons of gasoline were consumed on the trip just mentioned—18 miles to 1 gallon, and the roads were not ideal, some of the hills being very long.

I have already referred to defects and antiquated features of running gear and transmission.

Let me say in addition, in reference to the latter, the more direct this is the better. Do away with countershafts and all gears in mesh at ordinary speeds and you will save power and wear, and what is more important, at least to Americans, you will eliminate noise. The latter feature alone will never allow the foreign machine, however excellent otherwise, to become popular here. It is a standing charge even against some of our own machines. Some of my friends incline to electrics because the gasoline is noisy.

SUMMARY.

In brief, I summarize the features of the up to date machine suitable especially for the physician as well as for all-round use: Weight over and not under 1,000 pounds. Gasoline engine with electric contact ignition; silent and direct transmission; a clean, reachless, flexible yet firm and strong running gear; and lastly, the efficient and reliable brake which acts directly on the rear wheels and is capable of locking and holding the vehicle going up or down any hill.

With such a machine and sufficient time I am willing to undertake any journey, no matter how long, over any road, and I shall need neither mechanician, physician nor undertaker.