to passenger cars, a fifty seat passenger car can, in my opinion, be run more economically than the ordinary car. The first cost is $1,000 less, the weight and wear on the rails are less, the cost of repairs is less, and it requires less power to move six fifty seat cars, there being a difference of 18 tuns in favor of the six light cars."

Correspondence.

A Fever Case.

To the Editor of the Scientific American:

In the coal regions of Pennsylvania is a town of five or six thousand inhabitants, situated in a valley so narrow that, for a considerable distance, only one street is possible. Down the valley runs a stream or creek which has a fall of about 200 feet to the mile. Sometimes the stream has a depth of 3 or 4 feet, at others only as many inches; it runs under the front and back yards and houses, and is used as a very convenient sewer to carry off filth of every description, to bless the inhabitants along the river where the current is not so rapid. This creek is generally covered with heavy hemlock plank, while in every yard is a door through which garbage may be empt'ed.

During last October, a citizen sent his teamster to dig some earth from the cellars of two of his stores; the earth was thrown into the street and then hauled some half or three quarters of a mile up town, and spread over a vacant lot adjoining some dwelling houses. The earth taken from the cellars had a pungent odor, and a peculiar watery, iridescent appearance. On the night following its removal from the cellar, the proprietor of the place, who had superintended and assisted at the digging, was taken with violent cramps, which lasted several hours, and then gave place to a dull, languid feeling, with pains like rheumatism and a discoloration of the skin, the hands and arms swelling and becoming quite purple. The next day the teamster was taken ill, and the doctor pronounced the symptoms to be those of typhoid fever. The day following a young man, working in one of the stores from the cellar of which the dirt was taken, was also taken violently ill, and the doctor pronounced the case to be similar to that of the teamster. Upon the same day a girl about 14 years old, living in the dwelling adjoining the lot where the dirt was thrown, was taken with the same symptoms, which developed into violent typhoid fever and culminated in death a few days later. There were soon more than a dozen cases of the fever, as it began to be called, and in two weeks the number reached upwards of 60. The symptoms generally were violent headache, pain in the back of the neck, and high fever, with loss of appetite and general languor. When the fever subsided, the tongue became coated with a thick coat of dark green matter, which remained until the patient was convalescent. The fever averaged, probably, in each case from 12 to 15 days, but was followed by extreme weakness, loss of memory, dimness of sight, etc., lasting from 3 to 6 weeks additional.

The majority of cases did not result in a radically typhoid condition, as I understand it, the bowels being seldom attacked. In every case where a patient took a relapse from exposing himself too soon, the result was fatal, and in very few other cases did it prove so. The evidence hardly seems indisputable that the fever was contagious, as sometimes only one person, and sometimes several, in a large family took it. In one case a person who came more than a hundred miles from home, to nurse a patient, left him upon his convalescence, and was home only a few hours when she was taken with the same complaint, and went through a regular six weeks' course, although hers was the only case in the city of 25,000 inhabitants where she resided.

The question has arisen whether the half dozen wagon loads of putrescent mud, the atmospheric conditions, or the possibly foul emanations arising from the natural sewer, in which the water had been rather low for some time, caused the fever. If any of your readers can throw light upon this subject, we would be happy to hear from them, as six weeks' experience with this fever has sadly broken into twenty-eight years of otherwise uninterrupted health. H.

East Mauch Chunk, Pa.

Cotton Manufacturing in the South.

To the Editor of the Scientific American:

It is a well known fact that cotton factories at the South have been making money while many of those at the North have been compelled to suspend operations in whole or in part. Some of the reasons for this state of things are as follows:

1. Labor is cheaper at the South than at the North.

2. In consequence of a milder climate, the necessary expense of living is less there than in New England, as is also that of heating factory buildings, etc.

3. Coal is abundant in the South, and cheap water privileges can be obtained in every direction.

4. The purchase of the raw material direct from the producer saves the profits of numerous middlemen, the cost of several buildings, and long transportation.

To these advantages I am satisfied that still another of great importance can be added. The Southern factory should buy the cotton in the seed, gin, and then spin it, without packing into bales; and it is to urge some of your inventive readers to arrange machinery for this purpose that I write this communication. Some of the advantages of such a system would be as follows:

1. The yarn would be stronger. Baled cotton cannot be prepared for carding without beating, and thus weakening the fiber to a greater or less extent.

2. There would be less waste. Frequently much cotton is discolored and otherwise injured by foreign substances that have been packed with it. I understand that at the North and in Europe it takes from 108 to 115 lbs. of cotton to make 100 lbs. of yarn; and although the waste is not so great at the South, it is nevertheless considerable.

3. The cotton seed would be pressed at the same establishment, and the oil and oilcake sold for many millions each year.

4. The interest on gins and gin houses, which are now idle the greater part of the year, would be saved to planters.

5. The raising of cottons on small farms would be encouraged. The plantation system is not adapted to free labor, and is steadily breaking up; but until cotton can be readily sold in the seed, few small farms will be opened in the cotton section, for the reason that a man cannot afford to buy and operate a gin if he only plants a few acres of cotton. Better cottons and more per acre will be obtained on small farms than on large ones. The reason of this is that a hand can plant and cultivate two or three times as much cotton as he can pick. During the picking season, the entire field should be gone over at least once a day. Even under the slave system, planters who put in an acre of corn for each acre of cotton, and sent the smallest pickanniny into the field to pick cotton, were often unable to pick fast enough; and now that they have so little control over their workmen, the result is sometimes disastrous. But the small farmer if he is unable to get extra hands when he needs them, can generally rely on wife and children to help.

I am confident that, under the system proposed, the South can manufacture cotton cheaper than New England, or Old England either; and that if the proper effort is made, it need not be long before her income from cotton will be double what is now.

Manhatton, Kansas. ALBERT GRIFFIN.

Telegraph Alphabets.

To the Editor of the Scientific American:

In your issue for March 13, you published a communication from John Millis, of Addison, Mich., in regard to telegraph alphabets, which is calculated to mislead your many readers, inasmuch as it gives an utterly erroneous and empirical view of the subject. Mr. Millis states that the Morse "alphabet is defective, as the sound of a dash is very much like the sound of a dot with a succeeding space." Judging from this, I should say that Mr. Millis is as yet but a beginner in the art, for when most persons begin to learn to telegraph they fancy they perceive the same thing. The fact is, to any one at all practised in reading by sound, the defect is by no means as stated in the communication under review. No operator could possibly mistake a dash sounded for a dot with a succeeding space; and I do not know an instance, even among very ordinary sound operators, in which a mistake has occurred for the reason given by Mr. Millis.

The defect is in the spaced dot letters, C, O, R, Y, and Z. This was long ago recognized. Bain avoided it; but his alphabet was longer than the Morse. In the European code, also, the defect is avoided; and were it not for the difficulties involved in achange, the Western Union Telegraph Company would have adopted it some time ago. It was seriously proposed at one time, as I clearly remember. This being the acknowledged and long felt-defect in the Morse alphabet, to which innumerable errors can be traced and by reason of which they are occurring every day, how does Mr. Millis' proposition meet the case? In the Morse system, there are five such letters, Mr. Millis proposes to increase them to seventeen. In other words, his alphabet, besides being cumbrous and inadequate to speed, increases the chances of errors more than three times.

It may not be inappropriate to suggest that the composition of telegraph alphabets be left in the hands of the great body of experienced telegraphers, not only in this country but in Europe, who may well be presumed to know the difficulties and wants of existing systems.

Washington, D. C. WM. E. SAWYER.

The Sun's Orbit and Rate of Motion.

To the Editor of the Scientific American:

As you have been kind enough to publish several of my articles, relative to the retrograde motion of the sun in space, you will still confer a favor by publishing the following, relative to the size of the orbit of the sun and the rate of his motion.

The sun annually retrogrades sufficiently to keep the earth rotating 20 minutes and 23 seconds before she comes to her sidereal place in the heavens. Those 20 minutes and 23 seconds are the 70$\frac{3}{4}$ portion of a day, and, strange as it may appear, I am going to measure the sun's orbit by them.

As astronomers have not given, so far as I am aware, the computed distance of the earth from the sun since observing the transit of Venus, I will assume a distance; and when the distance is announced, the correction, if any, can be made.

Assuming that the distance of the earth from the sun is 92,000,000 of miles, the circumference of the terrestrial orbit will be 552,000,000 of miles. Now, in a sense, the earth sweeps around the whole in twenty-four hours. How many miles, then, are in the arc which the earth rotates past in twenty minutes and twenty-three seconds? Answer: 7,811,320 miles. That is the number of miles the sun travels in a year. Multiply the 7,811,320 miles by the number of years in precession, to wit, 25,800, and you have for the circumference of the solar orbit, 201,532,056,000 miles, and for its diameter, 67,177,352,000 miles: which shows that the diameter of the sun's orbit is nearly twelve times as great as is that of the orbit of Neptune; and when the two orbits are compared, the latter is like the eye or hole in the center of a large circular saw, compared to the saw itself.

Gloucester, N. J. JOHN HEPBURN.

Aerial Flight.

To the Editor of the Scientific American:

Will your various correspondents on this subject pardon my saying, after a careful study, that they are all on the wrong track? The first thing to be done is to comprehend the rationale of bird flight. This, I apprehend, is grossly misunderstood. It is supposed to be due solely to the mechanical movements of the wings, guided by instinct. Now, how could this be? Mere muscular effort will not reasonably account for the ascent in the air, still less for the propulsion forward. I would ask naturalists to consider, more particularly than they yet have done, the weight of the larger birds, the loads they sometimes carry with them, the great altitude to which they ascend, and the length of time they continue on the wing. Think of birds of passage flying for consecutive days without a single break on the journey, and that often against a strong head wind, the wings moving, in many cases, over 500 times in a minute. What a labor to be accounted for! It is manifestly above bird strength. If, again, they do rest upon the wing, all the greater is the mystery, for they would now have to be both kept from falling and glided onward by a power we know not of, otherwise one of these two catastrophes would ensue: Either they would fall to the ground, or they would fail in their journey; they would gain any direction but the right one. Upon the muscular effort theory, they would have before them a labor quite exceptional, so herculean that nothing in Nature is to be compared with it. Before they had gone many miles, they would fall to the earth exhausted, and die. Despite appearances, it must surely be that birds in their flight are not entirely dependent upon muscular energy; there must be no labor in the question at all. A beneficent Creator has given them the power of flight as their natural mode of transit; hence to fly, to them, is as instinctive, as natural, as it is for the heart to beat or the lungs to be incessantly inhaling and expelling large volumes of air. The animal flame internally performs unremitting labor, but without effort expended; toil there is none, but on the contrary, relief. To the winged tribes, it is a labor to walk, hence they are doomed to fly, and that is manifestly one of the crowning pleasures of bird existence.

The winged insect tribes afford more striking proof, I think, that flight is not entirely the effect of mechanical effort. The common bluebottle flies but little; he darts from place to place as if his wings seemed to do no more than balance him.

I do not think it possible to explain the phenomena in question without calling in the aid of some force hitherto unsuspected, which, for want of a better term, might be looked for under the name of "will power." If something could be laid hold of by investigation in this new channel, and applied to the balloon, aeronauts might, with greater cheer, prosecute their labors, and save some money and some necks, by making the discovery known. Huxley may be approaching the line of thought. MOUNT NEBO.

Dunedin, New Zealand.

Early Steam Navigation.

To the Editor of the Scientific American:

In reply to the question: "What was the name of the first steamship that crossed the Atlantic?" you answer: "The Savannah," built by Crocker and Fickitt in New York, in 1819.

My father, Dr. C. P. Van Houten, of Amite City, La., who will be 82 on April 15, 1875, writes me as follows: In 1816 he engaged with Allaire and Stoutinger, steam engine makers in Fulton's old works in Jersey City, he having previously served his time at the business. He afterward engaged with Daniel Dodd, engine maker, of Elizabethtown (now Elizabeth), N. J. Dodd soon placed him in charge of his works; and during his time, in 1818, the steamship Savannah received her engines and boilers from Dodd's shop, was fitted out and made a voyage to Russia, calling at Liverpool. She was the first steamship that crossed the Atlantic.

Matteawan, N. Y. P. L. VAN HOUTEN.

Frozen Water Mains.

To the Editor of the Scientific American:

The present severe winter, with its continued low temperature and severe frosts, has been a cause of much loss and damage to the systems of water supply. Steam fire engines have been rendered helpless, and burning towns left to the mercies of the elements. A remedy might be found in laying an additional pipe under all mains and service pipes, through which steam could be injected and the mains thus kept from freezing. The steam pipe should be immediately under the water pipe, and it could be arranged with a branch terminating at each fire plug. The steam pipe should also be supplied with means of relieving the pipe from the water of condensation.

The steam fire engines could be arranged to force steam into the pipe to thaw out the mains and fire plugs, and the action of frost might be very much resisted by forcing steam through the pipes occasionally in seasons of extremely cold weather. C. F. H.

Hazleton, Pa.

Small Steam Engines.

To the Editor of the Scientific American:

I have been much interested in reading the various statements as to the results accomplished by small steam engines, but why does not some one manufacture them for sale? The demand for small motors, for driving lathes, coffee mills, washing machines, and many other uses, is very great and rapidly increasing. Only yesterday, I was inquired of by a man who said he had examined all the advertisements in the SCIENTIFIC AMERICAN and other papers he could find, but nowhere could he find a steam engine of from one half to

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one horse power, nor could he find any one who could inform him where such an engine could be had.

If some person would make such an engine and boiler, that could be sold at a reasonable price, I am confident large numbers could be sold. As they would be used by amateurs in or about residences, they should be as simple as possible. No money should be expended on them merely for show, such as planing or polishing parts which can be painted; but they should be strongly built, and special care should be taken to furnish ample boiler capacity, with strength sufficient to prevent accidents.

Thinking persons are now convinced that much of our domestic labor can and should be done by power. It is a disgrace to our civilization that a woman should be compelled to break her back over a wash tub and board. Very few men would be willing to do the same work all day; and there is no reason, why this operation, which is a combined chemical and mechanical process, should not be done by machinery, and so of many other domestic labors.

Some fifteen years ago I had great difficulty to find a small foot lathe, as no manufacturer appeared to make one for sale; and after writing far and wide, I only succeeded in getting one from a man who built it for his own use. Today they are regular articles of trade, made by several concerns, all of whom find ready sale for them. The same would undoubtedly prove true of small engines. Who will do it?

Washington, D. C. W. C. DODGE.

An Appeal to Inventors.---A New Invention Greatly Needed.

To the Editor of the Scientific American:

This part of the country is infested with fleas and sand flies, and so far I have been unable to find anything that will either drive them away or kill them. We have tried rock camphor, carbolic soap, and kerosene oil, and have so far failed. The fleas infest our houses and barns, and almost every animal that walks. Some people say that the sand breeds them, some attribute them to the hogs, but there have been no hogs running round here since the war. Some people say that the fleas are not as bad as they were just after the war, but both pests are terrible. We keep our bedrooms dark, and undress outside; and keeping camphor in the beds, we have better nights, but in the morning they go for us, as hungry as ever and by the score.

The sand flies go for both man and beast, especially on still, moist mornings and evenings, and all day when it is still. Some people smoke to drive them away from the face, and the negroes substitute a stick in the mouth with a bunch of burning rags on the end; but the little persistent pests will bite the ears, hands, and neck, in spite of everything. Kerosene oil will keep them off for 5 or 10 minutes; but it evaporates, and they bite as badly as ever. If there is anything known to the scientific world, that will either kill or drive them off, you will confer a great boon on a large suffering community by letting us know of it.

Borel Plantation, St. Mary's, Ga. WILLIAM STEELE.

PRACTICAL MECHANISM.

NUMBER XX.

BY JOSHUA ROSE.

PUMPS.

Pumps are commonly divided into three classes, the suction pumps, the force pumps, and the suction and force pumps.

SUCTION PUMPS.

A suction pump causes water to raise itself, by relieving its surface of the pressure of the column of air resting upon it. The principle upon which it acts may be explained as follows:

The surface of all water exposed to the air has the pressure of the air or atmosphere resting upon it; if, therefore, one end of a pipe or tube be lowered into water, and the other end be closed by means of a valve or other device, and the air contained in the pipe be drawn out, it is evident that the surface of the water within the pipe will be relieved of the pressure of the atmosphere; and there will be no resistance offered to the water to prevent its ascending the pipe. The water outside of the pipe, still having the pressure of the atmosphere upon its surface, therefore forces water up into the pipe, supplying the place of the excluded air. The water inside the pipe will rise above the level of that outside of the same in exact proportion to the amount to which it is relieved of the pressure of the air, so that, if the first stroke of a pump reduce the pressure of the air contained in the pipe from 15 lbs. on the square inch (which is its normal pressure) to 14 lbs. per inch, the water will be forced up the pipe to the distance of about 2¼ feet, because a column of water an inch square and 2¼ feet high is equal to about 1 lb. in weight.

It is evident that, upon the reduction of the pressure of the air contained in the pipe from 15 to 14 lbs. per square inch, there would be (unless the water ascended the pipe) an unequal pressure upon its surface inside as compared to that outside of the pipe; but in consequence of the water rising 2¼ feet in the pipe, the pressure on the surface of the water, both inside and outside, is evenly balanced (taking the level of the outside water to be the natural level of the water inside), for the pressure upon the water exposed to the full atmosphere will be 15 lbs. upon each square inch of its surface; while that upon the same plane, but within the pipe, will sustain a column of water 2¼ feet high (weighing 1 lb.) and 14 lbs. pressure of air, making a total of 15 lbs., which is, therefore, an equilibrium of pressure over the whole surface of the water at its natural level.

If, in consequence of a second stroke of the pump, the air pressure in the pipe is reduced to 13 lbs. per inch, the water will rise up it another 2¼ feet, and so on until such time as the rise of the column of water within the pipe is sufficient to be equal in weight to the pressure of the air upon the surface of the water without; hence we have only to determine the hight of a column of water necessary to weigh 15 lbs. per square inch of area at the base of the column to ascertain how far a suction pump will cause water to rise, and this is found by calculation or measurement to be a column nearly 34 feet high. It becomes apparent then that, however high the pipe may reach above the water level, the water cannot rise more than 34 feet up the pipe, even though all the air be excluded within the pipe, because the propelling force, that is, the atmospheric pressure, can only raise a column of water equal in weight to itself. It is found, however, in practice, to be an excellent suction pump which will raise water thirty feet.

From this it will be perceived that the terms "drawing water" and "suction pump" do not accurately represent the principles upon which this pump performs its duty; and it would be much more proper to call it a "displacement pump," since its action is simply to enable the water to rise by displacing the air from its surface.

The duty of this pump is, therefore, in the first place, to extract the air from the suction pipe, and, in the second place, to discharge the water from its barrel through the medium of valves in such a manner that the column of water in the suction pipe is at all times entirely excluded from the pressure of the atmosphere.

FORCE PUMPS.

A force pump is one by means of which the water is expelled from the pump barrel and through the delivery pipe by means of the mechanical force applied to the pump piston or plunger; the amount of power required to drive such a pump will, therefore, depend at all times upon the hight to which the water is required to be forced. When a pump is arranged to draw the water, and force it after it has left the pump barrel, it is termed a suction and force pump; but if the water merely flows into it in consequence of the level of the water supply being equal to or above that of the top of the pump barrel, it is termed simply a force pump. Hence a suction pump performs its duty in causing the water to rise to the pump, a force pump is one which performs its duty in expelling water from its barrel, and a suction and force pump is one which performs both duties alternately.

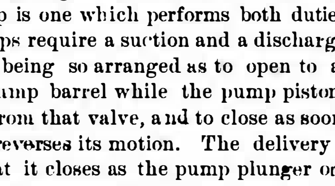
All pumps require a suction and a discharge valve, the suction valve being so arranged as to open to admit the water into the pump barrel while the pump piston or plunger is receding from that valve, and to close as soon as the plunger stops or reverses its motion. The delivery valve is so arranged that it closes as the pump plunger or piston recedes from it, and opens when the same approaches it. When, therefore, the pump piston recedes from the suction valve, the latter opens and admits the water; and when the piston reverses its motion, the suction valve closes, and the descent of the pump piston forces the water through the delivery valve, that being its only possible mode of egress from the barrel of the pump.

The arrangement of the valves may be the same for a force as for a suction pump (although it is advisable, in some cases, to place an additional valve to a force pump to prevent the pump piston from receiving the force of the water in the delivery pipe), the only difference being that the water is permitted to flow freely away from a suction pump, whereas it is confined to the delivery chamber or pipe in a force pump, so as to force it to the required hight or pressure, as the case may be.

PISTON PUMPS

A piston pump is one in which the water is drawn or forced by means of the piston fitting the barrel of the pump airtight, which is most commonly done by providing the piston with two cupped leathers, formed by being pressed in a die made for the purpose. The leather is soaked in water before being placed in the die, and is allowed to remain in the die until it is dry, when it will be sufficiently hard to admit of being turned in the lathe. Fig. 57 represents such a piston in section, A A being the leather, B the piston, C C

Fig. 57.



a piece of metal, placed between the leathers to fit their rounded corners, so that the sides of the leathers shall not move when the piston reverses its motion, and D the follower, which clamps the whole together by means of the pressure received from the nut behind it.

The capacity of a piston pump is its area multiplied by the length of its stroke; but it must be remembered that all pumps throw less water than their capacity, the deficiency ranging from 20 to 40 per cent according to the quality of the pump. This loss arises from the lift and fall of the valves, from inaccuracy of fit or leakage, and in many cases from there being too much space between the valves and piston or plunger.

A plunger pump is one in which a plunger is used in place of a piston, the gland through which the plunger moves serving as its guide and also keeping it air and water tight. The plunger is made smaller in diameter than the bore of the pump barrel, so that the capacity of such a pump is the area of the end face of its plunger multiplied by the length of its stroke, because the pump acts by reason of the displacement caused by the plunger entering the barrel. Pump plungers should always be draw-filed lengthways to prevent them from wearing away the packing so rapidly. It is always advisable in this kind of pump to allow as small an amount of space between the plunger and barrel as possible, for the following reason: When the plunger becomes worn, it is necessary to turn it up again in the lathe, thus reducing its diameter. The result is that there is so much air in the pump, between its barrel and the plunger, that it expands as the plunger leaves the barrel and is merely compressed by the plunger returning, so that the pump becomes very ineffective, and finally ceases to pump at all. If the pump, in such a case, be primed with water each time it is started, it may draw water, but not to its full capacity, as the air will remain in the pump barrel until such time as it may become absorbed by the water.

Suction valves for all pumps should be made as large in area as it is possible to get in, so that they will not require to lift much to admit the water to the pump: since it is evident that, when the piston or plunger commences to descend and the suction valve to close, the water passes back through the suction valve until it is closed, thus diminishing the effectiveness of the pump, and, further, causing the valve to close with a blow which proves very destructive to the valves, especially of fast running pumps.

The area of the opening of a suction valve must be at least equal to the area of the suction pipe, whose area is determined by the following principles: Water will not flow through a suction pipe in a solid stream at a greater speed than that of 300 feet per minute. It follows, then, that, the quantity of water the pump is required to throw being determined, the suction pipe must be of such a size that 300 feet of it will hold such quantity.

If the suction pipe be any smaller than that size, the pump will not be fully supplied with water; and the piston or plunger traveling faster than the supply of water follows it, there is, when it arrives at the end of its suction stroke, a partial vacuum in the pump barrel, which keeps the suction valve open. When the piston or plunger has descended until it strikes the water again (the suction valve not having yet closed), the water, descending with the piston, strikes the suction valve with a blow, which, as before stated, gives a backward impetus to the water in the suction pipe, and closes the valve with a blow very destructive to it; especially is this the case in a force pump or a fast running steam pump, in which latter case the steam piston accelerates in speed (when the pump piston has the partial vacuum, referred to, in it) because not only is the steam piston relieved from performing any duty, but it is assisted by the vacuum; so that it accelerates its speed greatly until the piston strikes the water in the pump barrel, which it will do with such force as to very probably break some weak part of the engine or pump, or cause the crossheads or piston to become loose. If the working parts of any pump are accurately fitted, it will deliver more nearly its full capacity of water when running slowly.

An air chamber placed in the suction side of any pump causes a better supply of water to the pump by holding a body of water near to it, and by making the supply of water, up the suction pipe, more uniform and continuous. Air chambers should be made as long in the neck as possible or convenient, so that the water, in passing from the pump barrel to the delivery pipe, shall not be forced up into the chamber at each stroke of the pump; for the air in the chamber becomes gradually absorbed by the water. If fresh water is continually passing into and out of the chamber, the air in it will soon become absorbed, and water will supply its place; but if the air chamber has a long neck, the water at its highest level in the chamber will remain there unchanged by the action of the pump, and will become impregnated with air, thus diminishing its propensity to absorb any more; and although the air will finally become all absorbed out of the air chamber, the process is a very much slower one, the air chamber being so much the more effective, and its elasticity, imparting a steady flow of water from the delivery pipe, being unimpaired.

Pumps whose pistons revolve are subject to the same defects from inequality of wear as are rotative engines, but the results are not so keenly experienced, because water will not leak through so rapidly nor to so serious an extent as steam, and, further, because the leakiness of the pump may be compensated for by an increase of the rotative speed of the piston.

Water will not, however, as before stated, flow through the suction pipe at a greater velocity than 300 feet per minute; so that, if the pump performs more revolutions that are requisite (according to its capacity) to carry off more than the quantity of water contained in 300 feet of its suction pipe, the power used in running those extra revolutions is lost, inasmuch as they are superfluous except for the purpose of compensating for the defects in the construction or leakiness of the pump, in which case the excess of speed becomes a necessary evil.

HAIR can be turned blonde, or, in other words, killed, by washing in a very weak solution of soda twice a day. We happen to know that two of the leading belles of New York society owe their much-admired golden tresses to this simple recipe. A piece of soda about as big as a small hickory nut to a quart or so of water is the right proportion. Less soda gives the hair a reddish tone. We do not advocate, however, any such interference with Nature.

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