

## CHAIN TOWING BY MAGNETIC ADHESION.

In 1856, at the beginning of chain towing upon the Seine, the monopoly of the traction was reserved to the Bovet system. Tug towing was impossible upon our river. The works of canalization executed since that epoch have made of the Seine a first-class waterway of wide section, of great draught, of feeble current, and of easy navigation—all of which are elements that have reduced the advantages of chain towing to the profit of tugging, so well that to the first period of tranquil possession have succeeded the present period and all the difficulties of competition. As chain towing has an undoubted superiority in the ascent of the river so much the greater in proportion as the stream is wider, while tugging is under all circumstances preferable in the descent, it is necessary, in order to have as perfect a service as possible, to employ towing tugs with propellers or wheels provided with a towing apparatus serving only for the ascent and permitting of throwing the chain at any point of the trip.

This is how Mr. De Bovet justifies the necessity of the use of a chain towing tug:

A tug for towing boats through a submerged chain anchored at the up-stream extremity. The apparatus that permits of the boat being hauled consists of two windlasses with parallel grooves. The chain winds around these several times in going from one to the other, just like the rope upon the two grooved pulleys of a tackle block. A steam engine revolves these windlasses and the boat moves forward a distance equal to the length of the chain unwound. As the bearing point is fixed, the rendering of the whole is excellent, and such that the towing up-stream is always notably superior to that done by paddle-wheel or propeller tugs, and such superiority is more and more marked in measure as it is a question of rivers with rapider currents up to the moment when the current becomes so violent that the warping becomes materially impossible. On the contrary, in the descent, chain towboats are inferior to tugs, and become absolutely incapable of towing trains of boats if the current is rapid, for they cannot unwind their chain at all speeds, and, among other inconveniences, they risk running with less speed than the boats that they have in tow.

Returning to the case of an ascent, the essential condition of the operation is that there shall be no sliding between the chain and the towing apparatus; in a word, the towboat should no more slide upon the chain than the locomotive upon the rail, and the necessary adhesion, not being capable here of being demanded of the weight, is obtained through the angle of winding of the chain, which is from six to eight entire revolutions upon its drum. But, since it is very difficult to keep the grooves of the windlasses equal, any inequality is shown by excessive tension upon the intermediate lengths, and such that one has been able rightly to say of windlasses that they are apparatus to break the chain.

Moreover, the length of chain existing upon the windlass is great (about 40 meters upon the Seine towboats), so that the boat is in reality riveted to the chain, running backward and forward indefinitely, and exchanging, with more or less difficulty, its train with those that it meets with successively above and below its line of travel.

In fact, it can leave the chain only by unwinding it and dropping it into the water, thereby creating a

slack of 40 meters at the point where the operation is performed, or by cutting it and carrying away the unwound portion—two methods that are incompatible, one of them with the security of the service and the other with the economy necessary for the maintenance of the chain.

If a boat could easily leave the chain at any point of its travel, it would suffice to provide it with a propeller, in order that it might redescend in free course with a train, and in order that it might become possible, in thereby having a two-way service with a single chain, to greatly improve the conditions of exploitation of

tractive stress. The length of chain wound on is 37 meters, which does not permit, as may be seen, of throwing the chain at the end of the passage up-stream and of running by propeller down-stream.

It seemed to Mr. De Bovet that the solution ought to be sought for in the use of a single drag pulley, upon which the chain would make but a fraction of a revolution, and having quite a small diameter, so as not to lead to too reduced an angular velocity, necessitating parts of excessive dimensions. The necessary adhesion has been sought for in the electric current, in making it magnetize a pulley in the groove of which the chain

passes. The results of the preliminary trials were sufficiently conclusive to decide the Towing Company of the Lower Seine and of the Oise to have a new towboat, the Ampere, constructed (Figs. 1 and 4), in which the towing apparatus has been replaced by a magnetized pulley, which, with three-quarters of a revolution only and 3 meters of chain (Fig. 3), develops a sufficient adhesion, is easily placed and removed, and is infinitely less exposed to wear and deterioration than the chains upon ordinary windlasses.

This towboat, constructed by Mr. Satre, at Lyons, is 33 meters in length, 5 in width, and 2.7 in depth, and has a mean draught of 1.9 meters while running as a chain towboat. Fig. 1 gives a general view and Fig. 4 a section and plan to a scale of 3.3 millimeters per meter ( $\frac{1}{300}$ ). Its engine, of the compound vertical type, placed nearly amidships, is capable, through two gearings, of directly actuating the screw, if need be, in developing 150 horse power at 150 revolutions per minute, or the towing apparatus, through bevel wheels, in developing from 60 to 80 horse power at 90 revolutions per minute. The chain, entering at the bow, passes over the towing pulley, A (Figs. 4 and 5), and is guided at the entrance by a roller, B, of non-magnetic metal. It passes, at its exit, over a massive roller, C, of magnetic metal, in order that, at this point, if the roller is brought into contact, it may give to the flux of force an easier passage than that offered by the chain, and that the latter, serving no longer to close the circuit, may more easily detach itself under the action of a very feeble tension of the hind length of the chain.

A tappet of non-magnetic metal is arranged above the pulley, so as to assure a detachment in all cases, by completing, if need be, the action of the roller, C, in case of running forward, which is the rule, and by acting alone in case of running backward. This last is very exceptional, and occurs only in case of maneuvers corresponding to very feeble tractive stresses upon the chain—so feeble that they can be realized with a very slight magnetization of the pulley, A.

It is necessary for a towboat moving upon a chain always in the same direction, in ascending the stream, to be able to act upon the evacuation of the chain astern, so as to allow it at moments to pay out now a little more and now a little less than it enters through the bow. For this purpose there is needed upon the deck a chain well, P, placed behind the towing apparatus and provided with a brake that permits of regulating the out-pay, of holding it where there is enough slack, and of letting it out where there is too much tension. The chain well being at P, the brake at the exit has been formed of a magnetized pulley, similar to the towing pulley, but smaller, the brake stress being much inferior to the tractive. When the current is

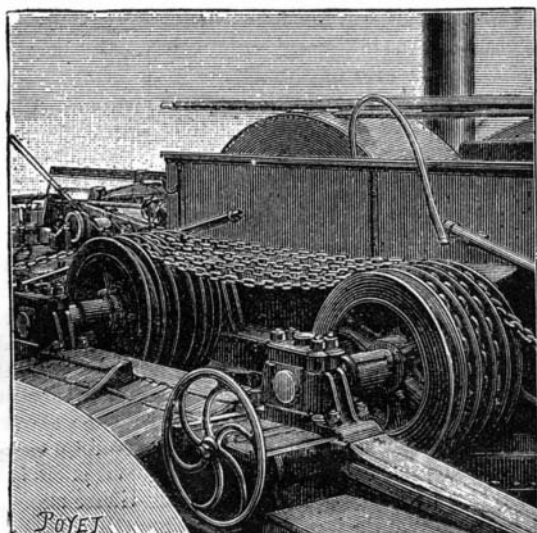


Fig. 2.—ARRANGEMENT OF THE CHAIN AND WINDLASSES OF AN ORDINARY CHAIN TOWBOAT.

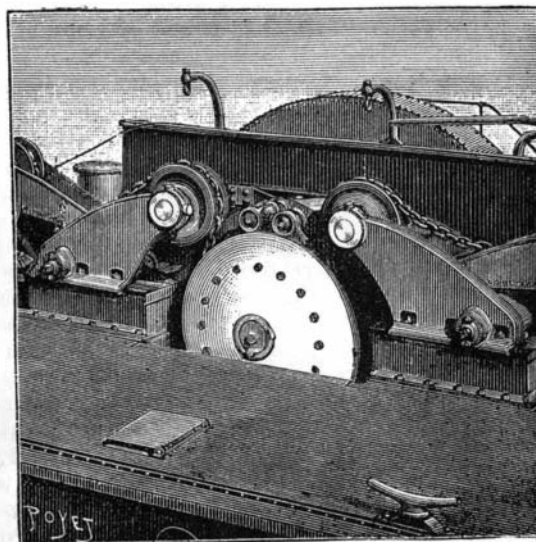


Fig. 3.—BOVET'S ELECTRO-MAGNETIC ARRANGEMENT.

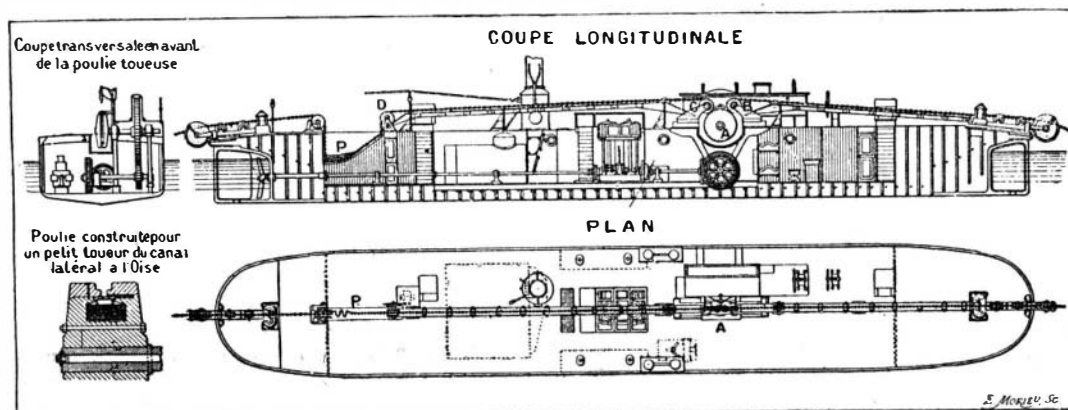


Fig. 4.—MECHANISM OF CHAIN TOWBOAT WITH MAGNETIC ADHESION.

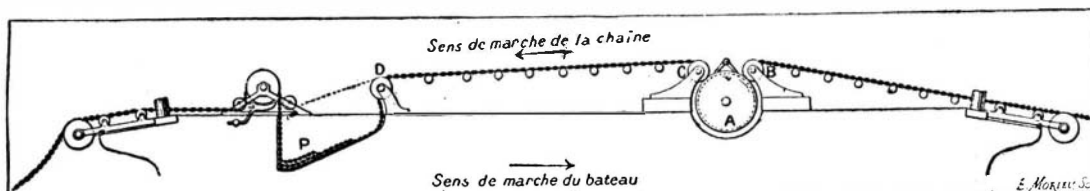


Fig. 5.—DETAILS OF THE ARRANGEMENT OF THE CHAIN.

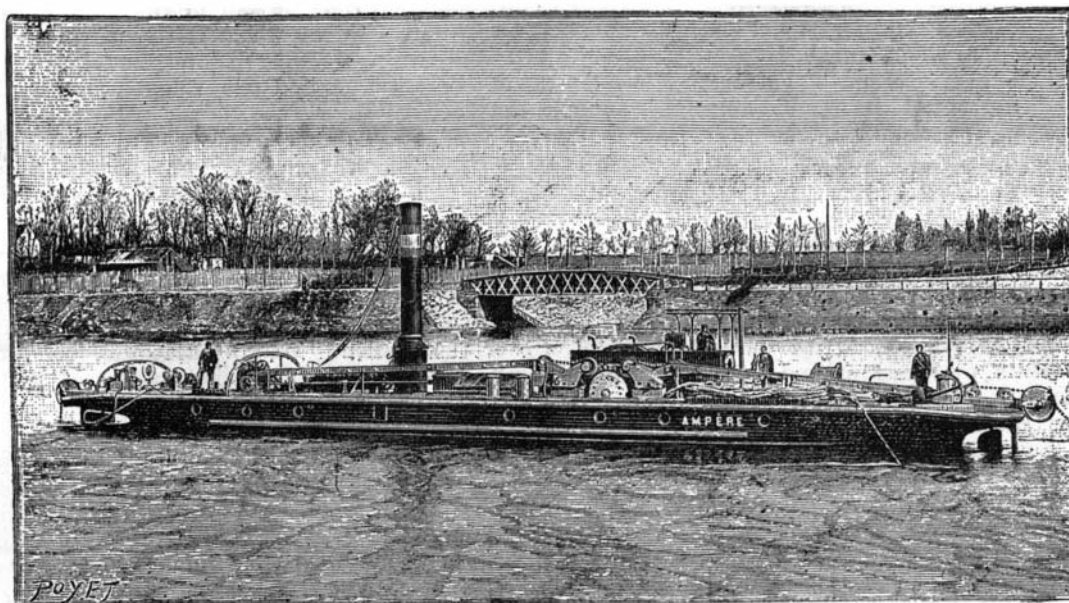


Fig. 1.—THE AMPERE, THE FIRST CHAIN TOWBOAT WITH MAGNETIC ADHESION.

the towing companies. The solution depends upon a system of impulsion by the chain that permits of the construction and putting in service of a boat capable of acting, as need be, either as a chain towboat or a tug.

Fig. 2 shows the essential arrangements of the old system of chain adopted at the origin by the Company of the Lower Seine and of the Oise, and universally adopted in France and foreign countries. It consists of two five-grooved drums with parallel axes, 3 meters apart, around which the chain winds a sufficient number of times (generally four half revolutions upon each drum) to have the adhesion balance the necessary

tractive stress. The length of chain wound on is 37 meters, which does not permit, as may be seen, of throwing the chain at the end of the passage up-stream and of running by propeller down-stream. It seemed to Mr. De Bovet that the solution ought to be sought for in the use of a single drag pulley, upon which the chain would make but a fraction of a revolution, and having quite a small diameter, so as not to lead to too reduced an angular velocity, necessitating parts of excessive dimensions. The necessary adhesion has been sought for in the electric current, in making it magnetize a pulley in the groove of which the chain passes. The results of the preliminary trials were sufficiently conclusive to decide the Towing Company of the Lower Seine and of the Oise to have a new towboat, the Ampere, constructed (Figs. 1 and 4), in which the towing apparatus has been replaced by a magnetized pulley, which, with three-quarters of a revolution only and 3 meters of chain (Fig. 3), develops a sufficient adhesion, is easily placed and removed, and is infinitely less exposed to wear and deterioration than the chains upon ordinary windlasses.

sent into it, the chain adheres to the upper part. A block, movable around a horizontal axis, balanced to such a degree as may be desired, bears against the lower part of the pulley and prevents it from revolving. The effect is reversed by varying the current.

At D is a roller, which, through simple friction, if a rotary motion be given to it, is capable of aiding in the out-pay of the chain at moments in which there would be too great a slack astern and in which the brake would operate. This roller, D, is actuated by a small dynamo, which is the simplest method of throwing into and out of gear at a distance when one has at his disposal, as is the case, an electric current.

When the chain is slightly slack, the action of the roller, C, is insufficient to produce a detachment. It is, therefore, of interest to increase the impulsive effect of the roller, D, which then operates continually, and the adhesion of which is regulated by constructing it like the principal magnetic pulley, and by supplying it through a special derivation taken from the common generating dynamo.

Another dynamo, situated in the engine room, actuates a centrifugal pump for the maneuver of the water ballast compartments, which are so arranged as to put the boat in different lines of water, according as it is a question of a tug or of a chain towboat.

All the maneuvers interesting the chain *en route* are reduced to the manipulation of three commutators corresponding to the three magnetized pulleys. As the adhesion is a function of the intensity of the current, there will be a sliding every time the tractive stress exceeds the adhesion. The power exerted will, therefore, be automatically limited, and any breakage of the chain be thus rendered impossible.

Such are the principal arrangements of the towage system carried out by Mr. De Bovet upon the Ampere. This, however, is not the only application to which electro-magnetic adhesion lends itself. It will be possible to utilize it in the gearing of engines and in the application of brakes to railway and street cars, etc.; but we have wished at present to describe only one of the most ingenious applications sanctioned by experiment, and on the eve of the introduction of a revolution into the present processes of chain towing upon canalized rivers.—*La Nature*.

#### The Physical Power of Mind.

DR. KARL MULLER.

It was said by Kant that a man need not sneeze against his will. We have no evidence as to how far he verified the proposition in his own person, but the expression has its significance, showing us that Kant regarded the will as a sort of regulator, if not the absolute, controlling power in the individual Ego. Properly speaking, he regarded body and spirit as interdependent—inseparable. Mind and matter were in his eyes a unity in which the action of the one called forth the reaction of the other.

We have no intention of reopening here the old strife between materialism and idealism. The object of our introductory remarks is simply to present the subject in its highest aspect, where it naturally suggests the question: By what means is this interdependence between the physical and spiritual brought about? Turn and twist as we may, we can suggest no other medium than our nerves, those innumerable agents in equally innumerable labors. Every impression to which our body is subjected produces a local stimulus or excitation, which is at once telegraphed to the central organ of our spiritual being, the brain, by one of these active agents. The sensation arises into consciousness, and in such wise that we are able to locate the seat of stimulation; the central organ reacts, and, in the case of a painful shock, for example, messages go to the heart, which is violently excited, thereby influencing the whole circulation, possibly making the knees tremble. Now, what is terror? Certainly nothing bodily, but a mere mental condition, and yet it may be sufficient to exercise the most powerful influence over any of our organs, even to paralyze them. How this occurs we know no more than we know how consciousness originates. It presents, however, a sufficient illustration of the fact that a disturbed mental condition can operate prejudicially to our physical constitution. That sudden joy, under certain circumstances, may equally prostrate the physical powers, proves only that extremes may produce like consequences.

What does this teach us? This only, that the mind is a power in our physical constitution, as great a power, perhaps, as even the heart or the lungs, if not a greater. Its special media are our senses, which, receiving impressions of stimuli, transmit them to the central organ, where they engender characteristic mental conditions. How must the eye be exercised in mastering all the impressions that fall upon it from the outer world! According as they are beautiful or ugly, they impress our mind pleasantly or painfully, and by its reaction our bodies are similarly affected. In the one case we may be disposed to dance, in the other we may be incapable of even eating or drinking. Similar effects may be produced through the organ of hearing. Word and tone are capable of generating the most powerful emotions. Music especially exercises an im-

measurable influence on even the simplest minds. Lively music impels people irresistibly to dance. The power is purely spiritual, but it reacts in the highest degree upon the body.

So, too, with the spoken word. Is it not wonderful how we are moved to anger or sympathy, how we may be exhilarated or depressed, by the mere modulation of another's voice, or by the narration of tales of humor, of pathos, or of horror? Of course ideas are awakened, but what power is there in ideas to make the hair stand on end, or the sweat ooze from the pores of the skin, or how can a thought make us dizzy? It is no satisfactory explanation to say that the dizziness was caused by a flow of blood to the head. What is it which makes so many people giddy when they stand on the edge of a precipice? Simply the idea of falling over. Every one familiar with the sensation knows that it feels as if his brain were the seat of confused emotions, which entirely upset his equanimity. But what causes the sensation? I have seen a mountain maid stand on the outer edge of the witches' dancing place in the Hartz, and let her eye wander calmly down the dark valley below, and I saw the same girl later overcome with dizziness while crossing a bridge, below which the waters seethed and whirled tumultuously. A strong will can do much, if not everything, to overcome this sensation of giddiness, which, if it arises, excludes all the more pleasurable ideas which the scene is equally capable of awakening.

The most powerful influence on our lives is unquestionably love; but this, too, is based on stimulus-sensations precisely as the poet says, "Thy beautiful figure excites me" (*Mich reizt deine schone Gestalt*). It originates in the pleasurable emotions which each inspires in the other; but what fateful revolutions, spiritual and physical, may it not work, whether in a joyous or tragical direction. It is the most spiritual of human sentiments, yet what devastation may an unfortunate love involve!

It is easy to say that it is the nervous system whose molecules vibrate at their highest ratio in tranquil love, but are arrested and confused in their vibrations when the sentiment is disturbed. But how is that brought about? Is there really a boundary between the physical and the spiritual in our being? In this realm we grope in darkness, incapable of recognizing anything but phenomena, but the more thoroughly we study the subject, the clearer appear the evidences for the conclusion that body and soul are one.

If we pass from love to hate, we have a new series of occurrences which operate powerfully on our physical nature. From jealousy to vengeance the road is straight, and all that lies between is blind passion. Why do we say blind? Because that is the actual condition which the mental life manifests. Not that the eye has lost the faculty of seeing, but that judgment, love, and humanity are overwhelmed by passion. As is well known to the medical profession, such mental excitations generate physical ailments, resulting, in some cases, even in madness. No one knows so well as the doctor for the insane how intimate is the relation between insanity and physical disease of the brain. To a doctor for the insane the idea of soul and body existing apart is simply ridiculous; but he would probably listen respectfully to the suggestion that the soul is not one with the brain only, but with the whole body.

Passing now to the realm of hypnotism, we find one mind influencing another, and through it the associated organism, by purely physical agencies. This, perhaps, affords the key to the tendency to yawn, laugh, cry, etc., in sympathy with others.

We must conclude, then, that body and soul constitute a unity, in which the healthy activity of each is essential to the healthy activity of both. The moral is that for a healthy enjoyment of life it is necessary to exercise the mental powers to a normal extent, and maintain a rigid control over the passions. Mental and physical health and vigor call for activity, apportionment of time, regularity of life, education of the will power for the attainable and natural, and the pursuit of truth, goodness, and beauty.—*Die Natur, Lit. Digest*.

#### The Value of Camphor.

Just at present, when the profession is carried away by enthusiasm for new drugs, it is well for us to remember that there are older remedies which are in danger of passing into obscurity. Not that the latter are unworthy of professional esteem, but owing to the fact that they have been crowded out by many new drugs, for which so much has been claimed, and which have undoubtedly, in many instances, deserved the credit which they have achieved. Frequently those of us who constantly employ the newer remedies find that they fail to produce the desired results, and are surprised, when at last we employ old friends, that we get results which, if produced by the newer drugs, would lead us to be enthusiastic in their praise.

One of the drugs which seems to be in danger of being lost to the profession in the treatment of a number of serious ailments is camphor. Forty or fifty years ago its use as a diffusible stimulant and nervous se-

ductive was widespread, and the best practitioners regarded it as a sheet anchor in the treatment of many diseases which tried their skill to the utmost. Thus no less an observer than the celebrated Dr. Graves believed that camphor was a very valuable drug when used as a diffusible stimulant in the treatment of those adynamic affections which find their type in typhus or typhoid fever. Under these circumstances it is to be administered frequently for days at a time, and, if the records can be believed, produces a condition of nervous quiet without depression which is of singular value to the patient. At the same time it seems rather to improve the digestion than to disorder it, exercises a distinct antiseptic influence over the stomach and bowel, and acts as a carminative or prevents the development of tympanites. Similarly, in cases of croupous or cartarrhal pneumonia, in which the patient's condition rapidly becomes asthenic, camphor proves of very marked benefit in quieting the restlessness, frequently decreasing or stopping the delirium, and exercising that peculiar influence, which seems to be inherent in some drugs, of producing a condition of general improvement which we are able to recognize, and yet which the most experienced physician is unable to explain. Because of its volatility it is naturally rapidly absorbed, and equally rapidly eliminated, and when administered should be given, under these circumstances, in most instances at least, every six hours. In typhoid fever which is complicated by diarrhea, camphor is undoubtedly one of our most useful medicaments, nor is its action limited only to the diarrhea of sthenic diseases. The popularity of paregoric has been largely won by the activity of the camphor which it contains. The recollection that all volatile oils, of which, for therapeutic purposes, camphor is one, tend very distinctly to prevent a serious outpouring into the intestine, at once indicates that camphor, either alone or combined with other drugs, is a valuable remedy for diarrhea.

It has been found in various portions of Europe, in a number of cholera epidemics, that camphor exercises its properties as an anti-diarrhea remedy and as a diffusible stimulant with singular efficiency. It has been given by dissolving it in absolute alcohol, and then adding this absolute alcohol to ordinary red wine. This treatment was nearly always followed by expressions of satisfaction upon the part of the patients, who stated that it prevented nausea, overcame their depression, relieved the cramps in the bowels and in the extremities, and by its warmth did much toward making them more comfortable. Its employment under these circumstances, though entirely empirical at the time, has more recently been proved to be a proceeding based upon rational grounds, and those who have read the Progress columns of the *Gazette* during the last few months will recollect several items in which it was shown that volatile oils and their derivatives act as intestinal antiseptics, and that red wine very distinctly inhibits the growth of the cholera spirillum.

In cases in which functional disorder of the nervous system results in cardiac palpitation or irritability with the production of attacks of anxiety rather than of true heart-pang, and in which the patient complains of a fluttering or sinking feeling in the præcordium, the spirits of camphor will give results almost equal to those obtained by the use of that harmless but very valuable remedy, Hoffmann's anodyne. Not only is this true, but in cases of dilatation of the heart associated with emphysema, chronic bronchitis, or true bronchorrhea, camphor will often give relief from the cough and the cardiac embarrassment without decreasing expectoration to such an extent as to permit secretions to accumulate in dangerous quantities.

Nor does the value of camphor as a therapeutic agent rest upon its value in internal medicine. In some cases of rheumatism, involving the joints or the sheaths of the muscles, camphor lotions are too frequently employed with success to permit us to doubt of its efficiency, and its influence upon the nasal mucous membrane in the early stages of acute coryza is undoubtedly worthy of praise.

We should not forget the recommendation, first made, we believe, by Drs. Ringer and Tilt, that camphor dissolved in cologne water or alcohol should be applied to the vertex in those peculiar cases of reflex uterine headache occurring at the menopause or at each menstrual epoch. In those cases of uric acid diathesis in which there develop multiple or single spots of hyperesthesia in the scalp, which are discovered by the patient either through the neuralgic pain which he experiences, or in brushing or combing the hair, camphor as a lotion will frequently relieve the tenderness.

It may seem unnecessary to call the attention to these well-known therapeutic points, and doubtless there are many of our readers who use the drug in combating these conditions in their daily practice. As we have stated, we believe that camphor is not used sufficiently, and it is with the object of increasing its general employment, and not with the idea of bringing forward any new points in its usefulness, that this article has been written.—*Therapeutic Gazette*.