An improved car wheel mould has been patented by Mr. John Forbes, of Harrisburg, Pa. This invention relates to certain improvements in car wheel moulds of that form in which the metal is poured through a central hole in the core and rises into the wheel space from the bottom; and it consists in forming a hollow core with an annular re-enforcing metal stiffening in it, perforated to permit the passage of air and gas through it, and combining this with the drag-sand, which is formed with a circular recess to receive the lower end of the core, and radiating channels that connect the hole in the core with the wheel space.

The flat link chains in common use are made of links riveted together, the strength of the chain being determined by the quality and size of the rivets and their resistance to the shearing strain or pull of the links, and when a link breaks one or two links have to be cut out and a new link put in, and new rivets also, which latter must be upset. Hence the operation of repairing a flat link chain of ordinary construction is slow and expensive. Mr. James T. Brough, of Jacksonville, Fla., has patented an improvement intended to facilitate the repairing and lengthening and shortening of flat link chains. The improvement consists of a flat link chain having the thick or double link made with both faces recessed and socketed at each end, the socket being undercut, and in forming each single link with a flat-headed stud projecting at right angles from one face at each end. The chain is made by coupling the double and single links together by means of the engagement of the studs on the latter in the undercut sockets of the former.

An improved apparatus for the water packing of snow-roads has been patented by Mr. Henry I. Grennell, of Medford, Wis. The object of this invention is to water pack the snow in the runner-tracks of snow-roads, and thus form a solid path way for sleighs. The invention consists of a sleigh carrying a water tank and heater and suitable conducting and delivering pipes, whereby the water may be heated and the hot water delivered into the runner-track of snow-roads to pack and solidify the same.

Mr. William T. Hall, of Fayetteville, Ind., has patented an improved stock car. The invention consists in dividing the interior of the car into compartments or stalls by a series of hinged posts connected by hinged end partitions and separable side partitions.

There are various methods of pivoting the natural roots of human teeth, but they fail or are defective in the matters of strength and firmness and in preventing the decay of the root. Dr. Henry W. F. Büttner, of New York city, has patented an improvement in artificial teeth, which consists in turning down the upper end of the tooth root, so as to form a circular shoulder thereon, the irregular upper surface of the tooth being cut off in a horizontal plane to accurately fit the metallic cap which carries the artificial crown. A cap fits upon the root, and it has an artificial crown attached to it.

Mr. Isaac T. Tichenor, of Auburn, Ala., has patented an improved material for making bags, which is impervious to atmospheric moisture, is not destroyed easily by the corrosive action of the contents of the bag, and is rendered strong and durable. The invention consists in a coarse cloth, such as a burlap, which is covered on one or both sides with a mixture of clay and tar.

Mr. John J. Tierney, of New York city, has patented an improved door securer, consisting in the combination with a screw, for securing a door, of a post socket having on its forward end the right angled plate fitting into a rabbet of door post and secured by screws, so that a burglar cannot remove the socket, even after he has withdrawn the bolt.

Mr. John B. Bennett, of San Luis Obispo, Cal., has patented an acoustic or mechanical telephone in which certain improvements render the instrument more efficient in giving a louder and clearer sound than has hitherto been obtained. It is of such construction that it can be placed in almost any place or position required.

THE GASTROSCOPE.—AN ELECTRIC LIGHT FOR THE HUMAN STOMACH.

The application of electricity in ways the most varied, and, perhaps, we might add, unexpected, has, within the last few years, developed with almost bewildering rapidity. As in so many other things, it has its applications also in medicine; perhaps one of the most novel and ingenious of these, as well as the least generally known, is the employment of the electric light to illuminate various parts of the body which are only obscurely visible, if they can be seen at all, under ordinary circumstances. There have been many instruments, says Mr. H. Wilson in the *English Mechanic*, designed to facilitate in this way the diagnosis of the less accessible cavities of the human frame. The ordinary instruments are constructed to reflect the light either of day or of some artificial source upon the part to be examined. The bright tablespoon which a medical man will often use to help him to see a sore throat more clearly by reflecting additional light upon it, is of course a primitive form of such instrument. In some of the most recently perfected of these appliances a small piece of platinum joining the electrodes from a source of electricity, is placed in the focus of a small mirror. By allowing a carefully regulated electric current to circulate through the wires the platinum is, of course, raised to a white heat and emits a brilliant light. This is reflected upon the part to be diagnosed, which is thus made clearly visible to the operator. Instruments for viewing the interior of the bladder, the œsophagus, or the stomach (for this unruly and mysterious source of trouble is no longer to escape the searching gaze of science), are necessarily more complicated than those for diagnosing, for instance, the mouth or the ear.

Fig. 1.

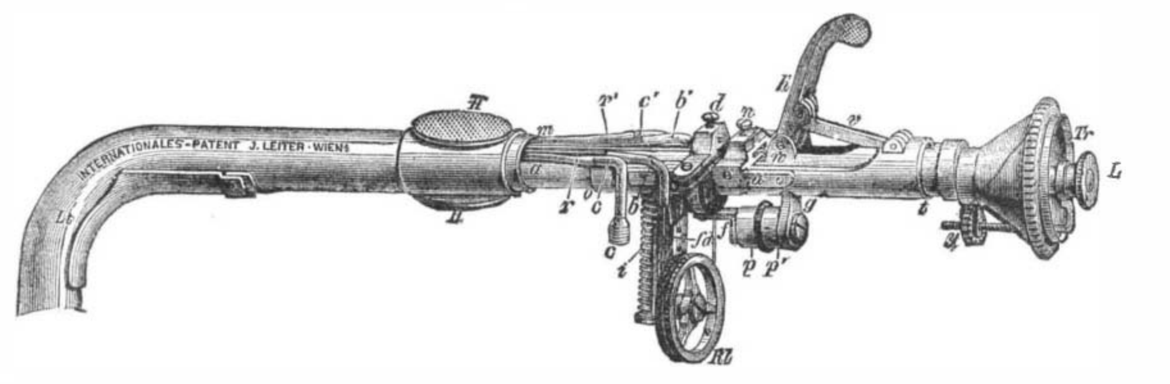


Fig. 3.

Fig. 2.

Fig. 4.

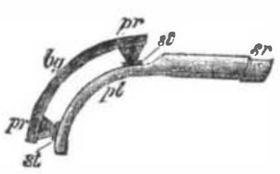


Fig. 5.

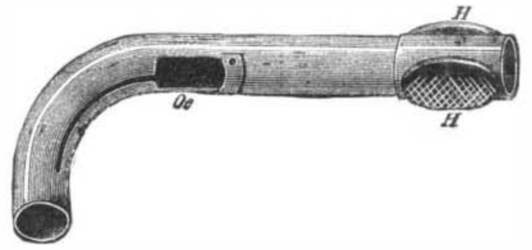


Fig. 6.

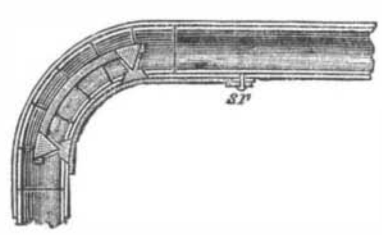


Fig. 7.

Fig. 8.

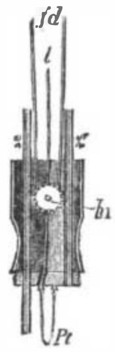
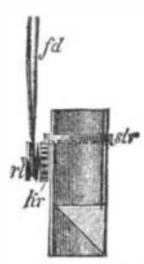


Fig. 9.



THE GASTROSCOPE.—AN ELECTRIC LIGHT FOR THE HUMAN STOMACH.

We select the gastroscope for viewing the interior of the stomach, as the most ingenious and remarkable of all these instruments which have recently been brought to great perfection in Vienna, and also as showing to what a point of delicacy the execution of scientific instruments has been carried in our day. We should add that the gastroscope is not a mere model or plaything, but has been in actual use. A figure of the complete instrument is shown in the two blocks, Figs. 1 and 2, and reference to it and to the smaller cuts will enable us to explain the principal features, which will, we think, interest all lovers of ingenious mechanical appliances.

The gastroscope consists mainly of a rigid horizontal tube, Fig. 1, *s*, terminating in one direction in the eyepiece, L, and in the other prolonged into a partially flexible tube, which can be passed down the œsophagus until its end reaches the stomach. This flexible metal tube, Fig. 2, is formed of 60 annular pieces, united by lateral joints, and thus forming a completely closed tube, whether it be disposed in a straight line or in a curve, without any chinks or openings, in which, did they exist, the folds of the mucous membrane might easily be caught and lacerated. This close-fitting arrangement is effected by making the inside of the upper end of each annular piece taper outward, and the outside of its lower end taper inward to an equal extent, so that one piece fits into another. As this tapering is only effected out of the thickness of the metal, this gullet-pipe constitutes a tube of uniform diameter both within and without. Moreover, the edge of each of these annular joints is filed away on opposite sides; on one side to a considerable extent, so as to enable it to be bent into a spiral, but on the opposite side only enough to allow it to be opened out till it forms a straight line. A glance at Fig. 2 will best supplement this explanation.

The jointed flexible tube terminates in a sort of tiny lantern, *z*, which consists of an inner and an outer glass tube-head. Inside the inner glass is seen the little loop of platinum wire, P*t*, the ends of which are of course joined to wires which run up the interior of the tube and can be connected at pleasure with the electrodes of a battery, by means of the screws, *d* and *n*, Fig. 1, and thus cause the incandescence of the platinum, which furnishes the illumination From this, light radiates freely on all sides and illuminates the interior of the stomach. A portion of the rays which fall upon the side opposite to the little window, O, Fig. 2, situate immediately above the lantern, *z*, are of course reflected back into it, where by means of the prism, P*r*, Fig 3, they are reflected upward in the vertical direction of the tube. Passing through the series of lenses, L*i*, they are parallelized, and arriving at the bend, L*t*, Fig. 1, are deflected by refraction to a horizontal direction by the coupled prisms about to be described, and seen in Figs. 4 and 6, whence, reaching the eyepiece at L, they convey to the observer's eye an image of a portion of that side of the stomach which may be opposite the window, O.

In order to deflect the rays of light from the vertical direction of the tube, *s*, to the horizontal one of the tube shown in Fig. 1, which terminates in the eyepiece at L, prisms are employed in the bend at L*t*. Fig. 4 shows the arrangement of these prisms, which are coupled immovably upon the curved piece of metal, *bg*, and are attached at their apices on very narrow metal supports, *st*, *st*, to the curved plate, *pl*, the exterior of which is seen in the under side of the bend at L*t*, Fig. 1. (Fig. 5 represents the guide-tube without this plate.) The most ingenious feature of this arrangement is that it allows the gullet-tube to move freely backward and forward through the curved outer tube or guide, Fig. 5, and yet at the same time maintains the prism in a constant position. This is effected thus: The guide-tube, Fig. 5, has a small oblong aperture, O*e*, on the under side, which is of just sufficient size to allow the insertion of the prisms one after another. The aperture itself is prolonged into a slit for some little distance in the direction of the lower end of the tube. A corresponding slit in the tube, *s*, Fig. 1, slides along the prism supports, which thus offer no obstacle to the motion of the gullet tube, which in this manner is movable within the outer tube, while the latter and its inclosed prisms retain a constant position. This arrangement will be better understood by a reference to the sectional drawing of the two tubes and prism plate, Fig. 6.

To obviate the inconveniences which might arise from any elevation of temperature in the stomach, the space between the two glasses of the lantern is kept filled with water, and communicates with two diminutive caoutchouc pipes, *rr*, conveyed down the main tube, as seen in the sectional drawing, Fig. 7, and terminating in the bent nozzles, *c c'*, Fig. 1. To these further India-rubber tubes are adapted, one to supply, and the other to lead off the water which is thus kept in perpetual circulation, and the temperature of which has of course to be regulated so as to obviate any inconvenient degree of heat produced in the stomach.

The crowning piece of contrivance and delicate workmanship in the instrument is an elegant appliance, by which the extremity of the gullet-tube, with its little window, may be made to revolve. The operator has merely to turn the little milled wheel, R*l*, Fig. 1, round which is stretched the silk cord, *fd*. The latter passes down the tube and round the tiny wheel, *kr*, shown in the section of the tube, Figs. 8 and 9. This tiny wheel, which, it will be observed, is toothed, plays into an indented ring round the interior of the lower rotatory portion of the tube, Fig. 9, which it can by this means cause to revolve whenever motion is imparted to itself by the agency of the silk cord which communicates with the milled wheel, R*l*, placed conveniently near the eyepiece. This ingenious and delicate contrivance obviates the necessity there would otherwise be of withdrawing, readjusting, and reinserting the instrument in order to observe different portions of the stomach, for the slightest turn of the wheel, R', causes a corresponding movement of the terminal of the gullet-tube with its window, and thus makes different parts of the interior circumference of the stomach successively visible to the eye of the diagnoser. Wherever a small supply of electricity is to be had, there the instrument may be used. A small portable apparatus for preserving a sufficient quantity of electricity has been designed by the maker, and now that the storage of electricity has become a recognized possibility, the ingenious instrument we have very briefly described may probably prove a welcome aid to the medical man in throwing a new light upon the stomach, that mysterious source of so many of "the thousand natural shocks that flesh is heir to."

Woolen Thread.

BY CHARLES VICKERMAN.

I have said that our worsted friends could spin our forty skeins wool into an eighty skeins worsted—a pure worsted thread is the smallest or highest state of tenuity into which wool can be got as a textile thread, and a pure woolen thread is the converse of this, it is wool in its thickest form or lowest state of tenuity as a textile thread. In worsted all the wool is available to go into the body of the thread, as the fibers are just laid end to end and parallel to each other. In the woolen thread, owing to its peculiar construction, part of the fiber is required to form that outside fringe, and the body or core of the woolen thread has not the fibers parallel. Thus the one stands at the North Pole and the other at the South Pole of the wool industry.

I wish it distinctly to be understood that I quarrel not with people as to the kind of yarn they prefer; that is their lookout, not mine. I aim only to place before the reader a scientific definition, and if he is not content with the forty skeins got out of the wool we have been considering, send part of the wool into Belgium, and he will get it spun to 55 skeins. You have a perfect right to have your own way, and to be pleased with seeing and having a nice yarn, small spun, as well as anybody else—some people have quite a passion for a deal of yard stick, give them plenty of length for their money, and they are satisfied. Got your yarn back from Belgium, have you? Yes, and *spun to fifty-six skeins.* Like it? Yes, it's beautiful, beats the English yarn hollow—it's smart, clear, and glossy, it's quite a coat on its back—the English yarn looks rough and hairy when laid alongside that I am quite ashamed of it; the Belgian yarn is immensely superior; it's a most beautiful yarn, and besides and better than all, *I have sixteen skeins more length* (there goes the yard stick again). Beautiful yarn, is it? Yes, *very beautiful indeed!* Allow me to remind you again that beauty is in the eye of the beholder, and it depends upon what the beholder understands by what he sees, and that again depends upon the correctness of the beholder's knowledge and perception of what is beautiful.

You have reckoned up the "haves" in respect to this Belgian yarn—you have more skeins—you have more smartness—you have more *clearness*—you have more *beauty.* Have you reckoned up and deducted the "*have nots?*" You have sixteen skeins more length, but on one side of the "have nots" you have sixteen parts lost of the *wooleny* character of the yarn. W-e-ll, but I don't see it in that way. I don't suppose you do; but whatever you want more than about half the worsted length, can only be had by sacrificing a corresponding proportion of the *wooleny* character of the yarn. You must not expect that you can be allowed to run off with all the sixteen skeins extra length and retain the *same wooleny* character in the yarn. You can have either one or the other, but you must not think to run off with both. You have got sixteen parts more length, then you have only twenty-four parts left of the wooleny character—fifty-six skeins of the length added to the twenty-four of the wooleny character make up the eighty skeins of the worsted spinner, at which point every vestige of wooleny character is gone. Try the carpet worsted spinner if you like, and get sixty-six skeins out of your wool, and then you will have only fourteen parts of wooleny character left to make up the eighty, where the game ends.

By carding as the Belgians do *you lay* the fiber of the wool *more toward the worsted form,* and that is the reason why you can spin it further, but it is at the expense of the *wooleny character,* and the yarn is all the less worth when it is spun. The Belgian system of carding is simply combing on a carding machine, as far as that is practicable; it is lashing out the fiber and laying it as much toward the parallel as possible. The Belgian carder does not use his stripper, nor does he use his fancy as we do—the strippers don't touch the workers, nor does the fancy work into the cylinder card. So that with cards set in this manner nothing but clean all-wool work could find its way through the machine, and that only in a lashing, combing manner. You can give what name you like to such a mode of working, but it certainly is not carding for woolen in its truest and best sense.

Oh! but the Belgian card is a "*specialty,*" chimes in some one, and calculated only to work pure wool. To all such specialty talk I beg to reply that the Belgian card will do almost any kind of work, and that is the best finishing card in the world; but that as a breaker card it is neither fit to work in Belgium nor anywhere else. Its true position is that of a finishing card, in which position, when properly worked with a proper fancy, it will turn off work in mixtures, mungo and wool, as well as pure wool, in such a style as no other card can. But I must not go into the subject of carding, as it is a subject of wide range, and has ample material in it for discussion.

There is one part of my subject, and that is the use, or uses, to which woolen yarn can be applied; and as a preliminary to that we must fix in our own minds which way to twine it, whether "*crossband*" or "*openband,*" and that again will depend upon the class of work we intend to use it for, whether for plain goods or for fancy goods. In the production of fancy cloths, whether in self color or in various colors, design or pattern has to be aimed at, and this involves sharpness of outline; and in order to *obtain* and *retain* this sharpness of outline, not only must the warp and weft thread cross each other at right angles, but the folds of the twine of the warp and weft thread must cross each other at right angles also, to enable the threads to retain their distinctness of individuality in the fulling *or milling and the finishing.* In using warp and weft spun the same way of twine, the folds of twine *do* cross each other at right angles in the cloth, thereby removing, as far as possible to remove, the liability of the fibers, and even of the threads themselves, to mingle bodily in the milling.

If our object in using our woolen yarn is to make a plain cloth, such as a doeskin or a superfine black broad, where it is requisite to hide the make of the cloth, then in order to obtain this result the weft requires to be twined the opposite way to the twine of the warp, in order to afford the greatest facility for the fibers mingling quickly, and felting and forming one homogeneous mass, hiding every vestige of the "make" or framework of the fabric. In the fancy cloth you require to preserve as much as possible the individuality of the threads for the sake of the pattern; in the plain cloth you require to lose it as quickly as possible in order to obtain the closeness of face and cover for the finisher to operate upon, and to do this the folds of the twine in the weft require to meet with, or fall in with the folds of the twine in the warp, *and not cross them at right angles* as in the fancy cloth. By using opposite twine for warp and weft in a fancy cloth you get closeness and evenness of face as in the plain cloth, but you sacrifice distinctness of pattern in doing it.

I need not attempt to name the variety of cloths for the make of which woolen yarn is useful—from the flannels we wear, and the blankets we rest upon after our day's toil, down through every kind of cloths, their name is legion—but will ask attention to one of the leading features of its use. The very peculiar structure of the woolen thread eminently fits it for the make of all kinds of cloth that require to be felted or "*milled.*" The worsted thread we have been considering is from identically the same wool, but its formation precludes it being made into goods where much felting is required. If you attempt to mill a fabric made from worsted to any considerable extent the material will gather up into beady lumps which we call "*nigger heads;*" the structure of the worsted thread is not fitted for felting or milling, whereas the woolen thread from its very structure is, in the highest degree, fitted and adapted for all kinds of fabrics where felting is requisite. As an extreme instance of its power of usefulness in this direction I may mention that the Greenland whale fishermen's stockings are knitted wide enough and long enough to admit of being drawn over and to cover the entire men's bodies, and are then taken and felted or milled down to the proper size in order to give them the thickness and warmth necessary to withstand the rigor of that northern region. The Scotch Highlander's cap, or bonnet as he calls it, is often knitted the size of a cartman's hay net, and then felted down to the size of the human head, hence their extraordinary wear. Another instance of the power of combination and strength through felting is the mysterious Gordian knot, of which we read in history, which promised the empire of the world to him who could untie it, and Alexander the Great is said to have cut it into two with his sword because he failed to untie it. This celebrated legend, if not altogether fabulous, is supposed to have had its foundation in the illustrious Gordius having cunningly felted his compound knot before hanging it in the temple.

Those tiny fibers, so insignificant and weak in themselves when tested separately, yet in combination and felted they are capable of being formed into a fabric that will resist tearing to an enormous degree, and are capable of resisting untold tons of pressure—in fact, no amount of pressure hitherto known, not even the hydraulic, can compel a wetted woolen fabric to yield up its water, yet the same fabric when relieved of its pressure and taken and hung up by one end, will quietly and of its own accord, drop by drop, yield up the water which it refused to yield to all the force that could be brought against it.

The cause or means by which, till lately, this very extraordinary and very mysterious process of felting is accomplished is the presence of these minute and curiously laminated scales that I have spoken of as being in immense numbers upon the stem of each hair or fiber of wool; and as in carding and spinning we had to use oil to prevent these scales locking into each other, so in the fulling or milling we have to pursue an opposite course, and apply soap to overcome any remains of grease that may have been left in the fabric, as no felting can be commenced until all the grease has been overcome. By the application of liquid soap we can clean out and open the mouths of these tiny scales; they open their mouths to soap like the flowers open to the sun, and hook into each whenever the fibers touch. Till recent years the greatest philosopher could not explain to us the principle on which the felting effect was produced in wool—there was the practical fact for thousands of years unexplained. To the presence of these scaly excrescences upon the hair or fiber of wool, and to the peculiar structure of the woolen thread, we owe those very remarkable transformations of textile fabrics from the loose, open, unserviceable, friable textures into those compact, unfriable, wear-resisting fabrics, which when fully milled and of fine quality result in those magnificent cloths made in the west of England.

The Magnesia Industry.

If we cause a solution of magnesium chloride to be absorbed by dry slaked lime, the magnesia set at liberty plays the part of a cement, and the matter may be moulded into small porous fragments. If one of these fragments is suspended in a solution of magnesium chloride, after some days the lime is entirely substituted by hydrate of magnesia. The fragment has been the seat of a double diffusion; the magnesium chloride has diffused itself from without to within, and is changed in the fragment into calcium chloride, which in turn becomes diffused from within to without. These two diffusions are simultaneous, and come to an end when all the lime has been substituted by magnesia. Here, then, is a means of reducing into a small volume a precipitate which would have occupied the entire bulk of the solution, if the fragment of lime had been stirred up in it at first. The same phenomena are produced if a great number of such fragments are heaped up in a suitable vessel, where a solution of magnesia is made to circulate slowly from the top to the bottom. In five or six days the conversion is complete; the solution may be replaced by pure water, and the magnesia washed completely. On stirring up it becomes a white pulp, which, if dried in the air, gives a very friable mass. It is hydrated magnesia which may remain for a long time exposed to the air without becoming notably carbonated. Its purity depends on that of the lime employed. In working on the large scale the author uses a paste of lime, which he forces through a plate of metal pierced with small holes, so as to eliminate stones and unburnt pieces. If these "worms" fell upon the ground, or into water, they would at once return to their pasty state. He therefore receives them in a solution of magnesium chloride, where they become at once covered with a slender coating of magnesia, which consolidates them so well that they may be heaped up to the height of 1·50 meters, still leaving between them the interstices needful for the circulation of the liquid. The paste of lime should contain from 34 to 36 per cent of anhydrous lime. The solution of magnesian salt should contain from 25 grammes to 40 grammes of anhydrous magnesia per liter. The laws of diffusion laid down by Graham are here at fault. The acceleration of the phenomena, due to an increase of strength, is balanced by the resistance opposed by a more consistent deposit of magnesia. The presence of sodium chloride, always abundant in the water of salt marshes, is indifferent. Soluble sulphate must be removed by adding the water from a former operation, rich in calcium chloride, and allowing the calcium sulphate to settle, after which the clear liquor is run off for treatment.

AGRICULTURAL INVENTIONS.

Mr. George H. Fowler, of Taughannock Falls, N. Y., has patented a horse hay-fork constructed with grappling bars hinged to each other by a cross head clevis. Trip levers are provided to receive the trip rope, whereby the loaded tines will be locked in place automatically, and unlocked by operating the trip levers.

Mr. Abner D. Dailey, of Riley, Ind., has patented a self-acting rest or support for the tongue of a harvester or similar machine, whereby the necks of the animals drawing the machine shall be relieved of the increased weight which is thrown upon the tongue when the machine comes to a stand.

An improved fertilizer distributer has been patented by Mr. John C. McCaskill, of Shoe Heel, N. C. This invention relates to improvements in that class of fertilizer distributers in which the feed hopper carrying the fertilizer and provided with a cut-off is secured to a plow beam, and it consists of a reciprocating cut-off having both its edges sharpened, whereby less power is required to operate the cut-off, and the lumps are divided by the cut-off.

The Destroyer of the Spruce Trees.

Maine's lumbermen—and, therefore, a large part of the rest of her citizens—are much disturbed by the destructive insects which are killing the spruce trees not only in that State, but in the adjacent British Provinces. The pine has lost its pre-eminence, and the spruce was getting in a position to be the representative tree, but the *Urocerus albicornus,* if the thing has been correctly identified, the Augusta *Journal* says, is killing off the spruce faster than the lumbermen could have done it, and greatly to their detriment. The white-horned *Urocerus,* for that is what his name means, is about an inch long and with wings which spread to two inches. They are as likely to destroy the pines into which they bore as the spruces, so far as the entomologists know. These insects are very prolific, and not at all uncommon. In England it has been often noticed and recorded, but there it was injurious only to ornamental trees, not to those on which so much depends in a business way and in whose preservation so many people are interested as the spruce forests of the Northeast. The prospect seems to be that things will go from bad to worse. Unless some smaller insect comes to the front and destroys the eggs of the *Urocerus,* it is hard to see what is going to save our spruce trees.