It is an asbestos ferrule, sustaining the two gas carbon rods, C, which are also held in copper tubes, T. At I is insulating material placed between the rods, and at F the conducting wires. This arrangement may of course be modified to suit differing circumstances. The insulating material is kaolin or other refractory substance which does not extend to the ends of the rods. When the current passes, the arc is produced between the extremities of the carbons; and as these become consumed, the light is gradually brought near to the refractory substance. This by the great heat is vaporized, in proportion as the rods burn away, so that protruding ends of the latter are always left, while they are always maintained at exactly the proper distance apart to which they are in the beginning adjusted. If a continuous current is used, the double consumption of the positive rod is provided for by making that carbon of double the area of section as compared with others: but the candle works better with alternating currents, in which case the carbons are of the same size. It is easy to reverse the apparatus so that the arc is produced at the lower ends of the rods. The candle may then be employed for an overhead light.

One of the principal advantages of the Perrin lamp is that it may be set in operation from a distance by merely establishing the current, the carbons having been previously prepared. M. Jablochkoff accomplishes this by placing a bit of carbon between his points. When the current passes, this becomes hot, reddens, and finally consumes. Continuity is then broken, and the arc appears. A bit of lead, or fine metallic wire, which melts easily, answers the same purpose.

The gradual fusion of the insulating material presents another advantage, namely, that it becomes conductive on attaining the liquid state, and admits of an elongation of the arc, which increases the light. This conductibility, moreover, admits of the candle being extinguished by the breaking of the circuit and then re-ignited, provided the interval is not longer than a couple of seconds. By this means, it is suggested, the candle might be employed as a means of transmitting signals by flashes, using the Morse telegraphic alphabet. This idea has already been adopted by the Russian army, and trials are soon to be made at the headquarters at Kischenew.

With the ordinary electric lamp, it is not possible to place more than one pair of carbons in the same circuit. This is owing to the necessity of regulation in apparatus where the movement of the rods is accomplished by electromagnetic machinery, which itself is dependent upon the variations of the resistance of the circuit produced by the changes of length of the voltaic arc. If the arc elongates, the resistance augments; the electromagnet weakens, and allows of the relative approach of the carbons. Consequently, if two lamps were placed in the circuit, and one arc elongated, both electromagnets would be affected, and hence both arcs would be shortened. So that the inter-relation of the two machines would constantly produce improper regulations, which would amount to no regulation at all. With the candle, however, it is immaterial how many arc placed in the same circuit, provided the current has sufficient tension to pass through all. In Paris, three and four lights have been maintained from a single electric machine.

M. Jablochkoff is at work on further improvements, some of which he has perfected, and will shortly lay before the French Academy of Sciences, when we shall present them to our readers. It will be seen, however, that the invention is one calculated greatly to extend the usefulness of electric illumination.

Communications.

Our Washington Correspondence.

To the Editor of the Scientific American :

An application having been made by S. D. Locke to Secretary Schurz for an order directing the Commissioner of Patents to rehear the case of Withington *vs.* Locke, on the ground that the case was heard by the Assistant Commissioner at a time when the Commissioner of Patents was present and attending to his official duties, the Secretary has made a decision, denying the application, reviewing and reaffirming the decision of Secretary Delano in the quadruplex telegraph case, as to the right of the Secretary to interfere with the acts of the Commissioner of Patents, when honestly performed. There is no complaint made on this score; and the attorneys of both parties appeared before the Assistant Commissioner and fully argued the case, thereby tacitly admitting his competence to decide the case. No objection was made by either party until the matter was decided, when the defeated contestant made this application. After referring to the long-continued practice of the Office for the Assistant Commissioner to act on cases when the Commissioner is otherwise engaged, the Secretary says: "The duties of the Assistant Commissioner have been, and are, such as the title of his office supposes; and I am of the opinion that where parties, as in this case, submit their proofs and arguments to that officer, with a full understanding of the practice so long established, they must abide by his decision or seek their remedy in the courts."

An appeal from the Board of Examiners-in-Chief having been taken by John N. Swift, an applicant for the registration of a trade mark which had been previously registered by Winfield Peters, February 29, 1876, the Assistant Commissioner affirms the decision of the Interference Examiner and the Board of Appeals. The trade mark in question is "The John C. Ragsdale Ammoniated Dissolved Bone." The name of Ragsdale is that of a gentleman who was president of an agricultural society in Georgia, and his name was taken, by his consent, to popularize the article in that locality. Swift, having been appointed to negotiate with manufacturers for the introduction of this and other brands of fertilizers, made a contract with the firm of Snowden & Peters to furnish the article under this name, which firm afterwards dissolved, and Peters registered the trade mark in his own name. Unlike applications for patents, priority of conception of the idea has no weight in the registration of a trade mark, and Swift not only fails to show that he ever used the trade mark, but he sold the manufactured article of Snowden & Peters on their account. The rights of Snowden or of the agricultural society are not at issue in this case, and are therefore not considered. The Board of Appeals decided the case in Peters' favor, which this decision affirms on the ground that Swift had never adopted or owned the trade mark at all in the sense contemplated by the trade mark law.

Mr. T. C. Connolly, for many years a Primary Examiner, has been reduced to First Assistant Examiner—cause said to be old age.

As a result of the competitive examination for the position made vacant by the appointment of Mr. Wilber as Examiner of Interferences, Mr. H. C. Townsend has been appointed Primary Examiner.

The exploration of our Western territories will be continued during the coming summer under Lieutenant Wheeler, Professor Hayden, and Major Powell, though the field of operations is not fully determined upon. Major Powell will probably continue the geological survey of the Colorado river country, in which his party has already made extensive explorations. Professor Hayden's exploring party last year completed the survey of Colorado, and will make during the summer an exploration north of the Union Pacific Railroad. The main party under Professor Hayden will make Cheyenne their headquarters, and the different divisions will reach the principal points of their fields of operations by the Union Pacific road. The northeast division will be under Mr. G. B. Chittenden, and operate in the Sweet Water and Mud river countries. The southwest division, in charge of Mr. Henry Gunnett, will examine a section of about 10,000 square miles in area on the western slope of the main Rocky Mountain range. The northwestern division, under Mr. Bechler, will survey an equal amount north of that already referred to. This part of the country is of more rugged character than the other sections, embracing within its limits features of surpassing interest. Its topography, geology, and natural history are more remarkable than any of the other sections. The various parties are made up, and will probably have left for their field of operations ere this is published.

Secretary Evarts is represented as expressing regret at the postponement of the extra session of Congress, as it may prevent the representation of the United States at the approaching exposition at Paris. He thinks, however, that a Commission may be appointed which would in part reciprocate the French representation at the Centennial Exhibition. It is probable that a formal communication will be addressed to the French Government explaining the situation. The Secretary thinks, however, that, if Congress when they meet should act promptly in the premises, there would still be sufficient time to organize a respectable representation of our products and manufactures.

The Bureau of Statistics has published a statement showing that the exports of "oleomargarine" or "butterine," from New York, during the seven months ending March 31, amounted to 3,549,629 lbs., of the value of $481,747, of which 2,352,250 lbs. were shipped to France and 991,329 to Great Britain. This probably accounts for a discovery that the English people have lately made that a large quantity of very nice-looking butter, said to have been imported from the island of Jersey, had never been made in Jersey at all; and they were puzzling their brains to find out where it had come from—having very strong suspicions that it was not really butter but oleomargarine.

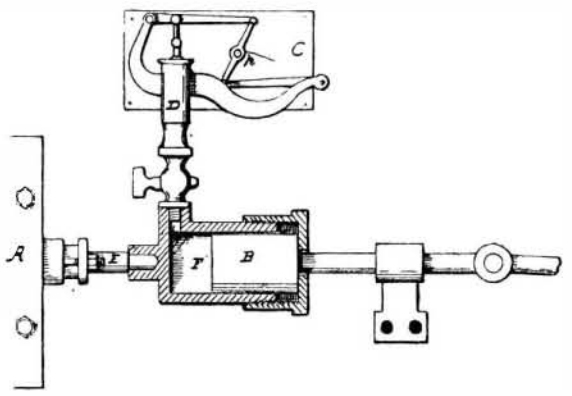
Our Board of Health has condemned a thousand barrels of an article sold in this market by a Chicago firm for vinegar, which, when tested by the chemist, was found not to be vinegar, but a compound containing $54\frac{54}{100}$ grains per gallon of anhydrous sulphuric acid combined with lime to form sulphate of lime (equivalent to $117\frac{26}{100}$ grains of gypsum per gallon) and 5 grains free sulphuric acid per gallon. This stuff is probably shipped all over the country, because it can be made so much cheaper than pure vinegar; and the people should therefore be warned to notice whether they are buying vinegar or diluted sulphuric acid.

Washington, D. C. OCCASIONAL.

A Practical Method of Determining the Friction of Slide Valves.

To the Editor of the Scientific American :

There has recently been considerable discussion of late concerning the friction of slide valves, from which it appears that there is a wide difference of opinion among mechanical engineers on this subject. I propose to show a method by which the friction of a slide valve may be measured; and for that purpose I have designed the instrument shown in the engraving. It is intended for taking diagrams which will indicate the frictional resistance of a steam engine valve at every part of its stroke. In the engraving, E is a valve stem of a steam engine, which works a valve within the steam chest, A. Attached to the end of this valve stem is a cylinder, F, which is provided with a nicely fitting piston, B. The stem of this piston, B, is joined to the eccentric rod of the engine. A common steam engine indicator, D, is connected with the upper part of the cylinder, F. If the cylinder chamber is filled with water, and the piston, B, is



driven forward by the eccentric (the water in the chamber being confined and inelastic), the motion of the piston will be communicated to the valve stem, and all the parts will move forward together as if they were rigidly connected. The cylinder, F, has an external nut by which the valve is drawn back in the opposite direction, and which prevents the piston, B, from being withdrawn from the cylinder. The thrust of the eccentric on the piston, B, will produce a pressure in the cylinder which will cause the pencil, *p*, of the indicator to rise and fall as the pressure increases or diminishes. The card, C, on which the diagram is drawn, is placed flat and stationary (instead of being mounted on a cylinder), while the indicator is carried back and forth with the valve. When the pencil, *p*, is brought in contact with the card, and the valve is moving forward, a diagram will be drawn, with a length equal to the stroke of the valve, which will indicate the pressure at every part of the stroke. The mean resistance of valve and power absorbed in foot lbs. can be determined by the usual method of working out steam diagrams.

If we wish to know the percentage of power of the engine which is absorbed in moving the valve, let a diagram be taken from the cylinder of the engine, and during the same stroke let a valve diagram be taken; then the foot lbs. of work developed by the engine may be compared with that absorbed by the valve. It may be said that the upward movement of the indicator piston would reduce the travel of the valve; but if the piston, B, is made sufficiently large, this reduction would not be of practical importance.

Indianapolis, Ind. JOHN C. DEAN.

The Origin of Petroleum.

To the Editor of the Scientific American:

On page 294 of your current volume, I notice an article on a "New Theory of the Origin of Petroleum." The idea may be new in print; but I heard it advanced during the winter of 1865–66 by a Mr. Smith, then a resident of Enterprise, Pa. He said: "By volcanic action, the earth's crust was broken, leaving crevices through which the ever-present water poured, which, coming into contact with the heated matter near the center of our globe, formed a gas which, in seeking outlets through the earth's crust, became more or less pent up, and necessarily would condense, forming our petroleum." He did not, as our friend in Russia has done, tell the nature of the matter with which the water comes in contact, but gave the idea generally. I think he wrote on this subject either to a Titusville (Pa.) or an Erie (Pa.) paper; but as to that, I am not certain. I remember, however, that he had a number of pretty sharp arguments with oil men on this theory. Mr. Smith went further, accounting for the gas that escaped the condenser by saying that "it passes into the air, forming into globe-like shapes, which in passing upward gather around them a moisture which of course confines them until, by gradually gathering this moisture (thereby gathering weight), they settle little by little until they mingle with the clouds, which generate electricity, or at least contains it, and are exploded by a spark, causing the flash and explosion—thunder and lightning." The latter part of his theory may be a little "airy;" but we must in some way dispose of this gas, and why not in this way as well as any other?

I think this will prove that we as a people are not so far behind the old world as such "credits" make us appear.

Buffalo, N. Y. L. E. PORTER.

Poisonous Enameled Ware.

Much consternation has lately been caused by the announcement in certain Boston papers that the enamels on the so-called marbleized and granite ware, which have for the past year or more found ready and extensive sale in our markets, have been found to contain lead and arsenic. The ware is quite handsome, of a mottled gray and white color, resembling somewhat certain varieties of marble in appearance. The vessels (principally culinary utensils) are in general enameled both inside and out. It will be seen from the letter given below that the statements as to the objectionable character of these enamels are not wholly without foundation in fact. The manufacture of the "marbleized" ware were awarded a medal in the Centennial Exhibition last year; and in the report of the judges, we find the state-

ment that the marbleized ware "differs from all other enamels in that it contains no poisonous or injurious substances whatever," and that "it is unaffected by excessive heat, or acids of any description."

We have received the following from Professor S. D. Hayes, the State Assayer of Massachusetts:

To the Editor of the Scientific American:

It will be replying to many inquiries about enameled ware if you will kindly give this note a place in your columns. I have recently analyzed various specimens obtained in the open market, from dealers, kitchens, agents, and directly from the makers of these wares, and I have seen them manufactured. The wares to which I refer now are known respectively as "marbleized" and "granite" iron wares, resembling each other so much in their mottled gray color that they are not easily distinguishable by persons unfamiliar with them.

The marbleized ware, as hitherto manufactured, contains considerable lead in a soluble form, with a little arsenic, and it should not be used in cooking or drinking vessels, although there is no objection to it for other purposes. Oxide of lead adds to the elasticity and fusibility of the enamel, so that there is a temptation to use it on the part of the workmen in the factories. But serviceable enamel ware can be produced without it, and I have analyzed pieces made within a few days, by the manufacturers of the marbleized ware, that are free from deleterious ingredients.

Some of the pieces of granite ware analyzed contained a small proportion of antimony (about one per cent), which is not a dangerous element in the enamel; and as there is nothing else present that is injurious, it is safe for use in the kitchen or elsewhere. The other pieces of granite ware contained no soluble metals whatever, excepting iron, and they are entirely harmless in composition.

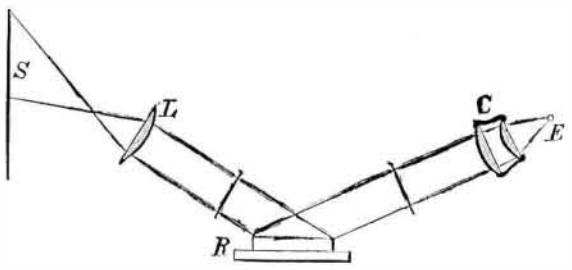
Boston, Mass. S. DANA HAYES,
State Assayer and Chemist.

PROJECTION OF INTERFERENCE COLORS FROM SOAP FILMS.

BY HENRY MORTON, PH.D.

Among all the phenomena of light, none are of such fundamental interest as those of interference; for none have a closer relation to the first principles of our theory as to the nature of light, or are so constantly coming up in all parts of the subject in connection with the most beautiful developments of color, as for example in the diffraction spectrum and in chromatic polarization. Yet until recently no means has been at command for exhibiting directly by projection this phenomenon in its characteristic beauty. Now, however, in the simple arrangement which I am about to describe, we have all that could be asked in this connection.

The arrangement is as follows: We place the electric light, E, in the lantern and remove the front element of the condensers so that the light comes out in a nearly parallel beam. The lantern is then turned obliquely towards the screen, and at the distance of about six inches from the condensers, C,



is set the soap film ring, R, with the soap film on its face. In such a position as to receive the light reflected from this film, is placed a plano-convex lens of about 12 inches focus, and about 4 inches diameter, which is adjusted back and forth by trial until the best effect is obtained on the screen. This effect is to begin with a gradually changing field of the most brilliant color, with occasional irregularities, but essentially passing through the tints of the spectrum to a deep violet blue.

When this point is reached, the ring, R, is to be rotated in its own plane a half revolution, so as to bring the lower part of the soap film to the top. The result of this is the flowing down over the film of various thicknesses of solution from the accumulation of its lower edge, now suddenly brought to the top. These varying thicknesses produce the most brilliant colors, and, by reason of this and the graceful cloud-like forms which are assumed, develop a spectacle with which I know of nothing comparable, unless it be one of the most gorgeous sunsets I have ever seen. Purple, crimson, gold, blue, and green, exquisitely blended and of intense brightness, are some of the tints.

The idea of making the ring rotate, so as to secure this effect from the flowing of the soap solution, originated with my friend, Professor George F. Barker, of the University of Pennsylvania, and rings of a very satisfactory character, involving several little matters of detail, are manufactured by Messrs. George Wale & Co., of Hoboken, N.J. The solution for the soap film is best made as follows: *a*. Take olive oil soap (white Castile soap), cut it into shavings with a plane, and dry thoroughly. Dissolve these shavings in alcohol until the alcohol is saturated. The solution should show a specific gravity of 0·880. *b*. Mix glycerin with water until it shows 17·1 Baume. To make the final solution: To 6·102 cubic inches of solution *b*, add 1·52 cubic inches of solution *a*, and boil until the alcohol is all expelled. This is obtained when the boiling point rises above 212° Fah. Cool, and turn into a graduated flask, and add water until the volume is again 6·102 cubic inches. Filter, if necessary, to remove oleate of lime.

Some of this solution being poured into a small plate or shallow dish larger than the soap film ring, bring the latter, face downwards, upon its surface, until the edge is just immersed, and then, keeping the face horizontal, raise gently and turn into an upright position. Should there be drafts in the room, an ordinary glass shade may be placed over the soap film ring, without interfering with the experiment, and the film will then be more persistent and safe.

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

The computations and some of the observations in the following notes are from students in the astronomical department. The times of risings and settings of planets are approximate, but sufficiently accurate to enable an ordinary observer to find the object mentioned. M. M.

Positions of Planets for June, 1877.

Mercury.

Mercury rises on June 1 at 4h. 19m. A.M., and sets at 6h. 29m. P.M. On the 30th, Mercury rises at 3h. 17m. A.M., and sets at 6 P.M.

The best time for seeing the planet is on the morning of the 20th, when it is furthest from the sun and rises an hour before it.

Venus.

On June 1, Venus rises at 4h. 57m. A.M., and sets at 7h. 57m. P.M. On the 30th, Venus rises at 5h. 41m. A.M., and sets at 8h. 35m. P.M.

Venus is small, but bright; and after the middle of the month it can be seen for nearly an hour after sunset, following almost exactly the path of the sun.

Mars.

On June 1, Mars rises a little after midnight and sets at 10h. 25m. in the morning. On June 30, Mars rises at 11 P.M., and sets at 9h. 38m. the next morning. Mars is in southern declination among the small stars of *Capricornus* and *Aquarius*, but is moving toward the north, coming into better position and increasing in apparent size.

Jupiter.

Jupiter is brilliant now in the southern sky, and will be in its best position about the middle of June. On the 1st, Jupiter rises at 8h. 50m. P.M., and sets at 5h. 51m. the next morning. On the 30th, Jupiter rises at 6h. 41m. P.M., and sets at 3h. 41m. A.M. the next day. Jupiter souths at midnight on the 20th at an altitude of 25° 10′ in this latitude.

The various changes of Jupiter's four moons can be seen with a small telescope, and many of the most interesting occur in June. On the 12th, Jupiter will be seen with only three moons until after 9 P.M., when the 1st moon will reappear from behind the planet. On the 19th, the 1st satellite will disappear between 8 P.M. and 9 P.M., by passing behind the planet; and between 10 P.M. and 11 P.M. the largest will disappear by coming in front of the planet. On June 26, Jupiter will be seen when it rises, with all four moons; but a little after 10 P.M. the first will disappear by the planet passing between us and the moon and hiding its light; this satellite will reappear in 2h. and 24m.; and for a little over an hour the four moons are still seen. But the 3d or largest is very near the planet, and a little after 2 A.M. comes in front of and is lost in the light of Jupiter. The small stars around Jupiter are those of the constellation *Sagittarius*.

Saturn.

Saturn rises on June 1 at 1h. 5m. A.M., and sets at 0h. 23m. P.M. On the 30th, Saturn rises at 11h. 10m. P.M., and sets at 10h. 29m. A.M. of the next day.

Mars and Saturn rise at nearly the same time on the 30th, but Saturn is 5° further north.

Uranus.

On the 1st, Uranus rises at 9h. 57m. A.M., and sets at 11h. 49m. P.M. On the 30th, Uranus rises at 8h. 9m. A.M., and sets at 9h. 57m. P.M. Uranus is still among the stars of *Leo*.

Sun Spots.

The report is from April 17 to May 16 inclusive. In the photograph of April 17, there appears on the western limb the group of large spots mentioned in the last report; but from this date to April 21 clouds prevented observations, and during that time the group disappeared. On April 21, a pair of small spots was seen far advanced on the eastern limb. On April 22, this pair was followed by a pair of very small ones. During the passage across the disk, there was a continual change in the number and arrangement of the spots in these two groups. Before April 30, both had disappeared. In the picture of this date, a small group was seen on the eastern limb; but after May 5 it could not be found. When last seen, it was near the center of its course, but very faint. The observation of May 5 showed a small spot, followed by a very faint one. On May 4, these spots had not been seen, and were first visible on the western limb. On May 8, a large spot was seen coming on. From May 8 to May 12, no observation could be made. On May 12, two large spots were seen near the center; one of these was seen before May 8, the other had burst out between May 8 and May 12. The one first seen on May 8 disappeared between May 13 and May 14 at about the center of its course; the other is still visible (May 16), and is at present preceded by a small spot not seen on May 15.

GRANT'S IMPROVED HORSE HAY FORK.

We illustrate herewith a new and ingenious apparatus for unloading hay and like material by means of horse power. The advantages claimed are simplicity and strength, and the adaptability of the device to unloading barley or any like substance, either long or short, ordinarily difficult to handle by appliances of this kind. Fig. 1 is an exterior view, and

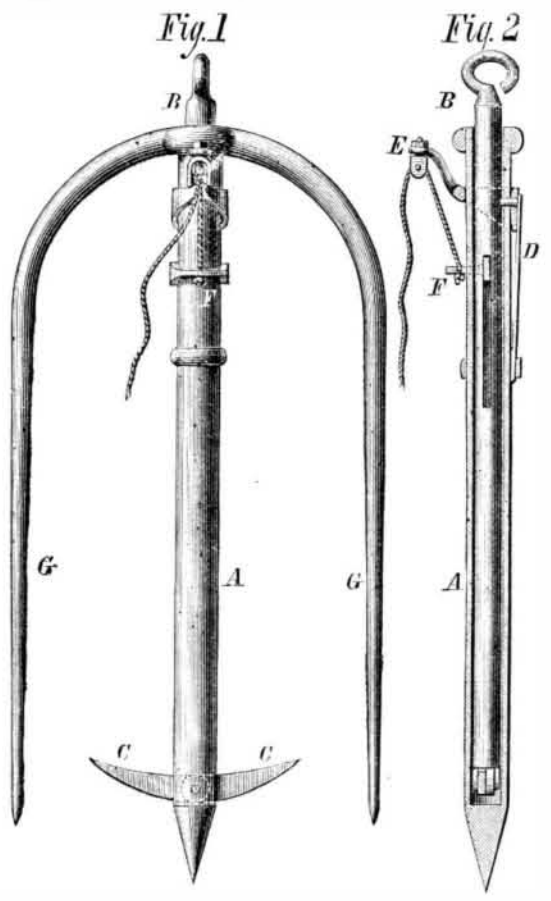


Fig. 2 exhibits a section of the central tubular tine, A. Into this tine fits a tubular plunger, B, which is provided at its upper end with a hook, and is plugged at its lower extremity, where are affixed ears to which the barbs, C, are pivoted. The spring, D, is clamped to the tine by a band and screw, and has a catch pin which passes through the disengaging lever, E, and the side of the tine, and enters a hole in the plunger, B. The lever, E, encircles the tine, and rests under the spring, and is held in place by the catch pin. The end of this lever is bent upward, and is provided with a small pulley. At F, is a key, which passes through a mortise in the tine and through a slot in the plunger, thus serving to limit the motion of the latter. The end of the key is bent over the front of the tine, and is formed into an eye, to which the disengaging cord, which passes upward over the pulley, is attached. At G are lateral tines, which are detachably secured to the central tine, so that, when a light fork is desired, the latter may be used alone.

In using the apparatus, the plunger, B, is drawn upward until caught by the catch pin. In this position, the barbs, C, are retracted. The fork is then lowered into the hay or grain until well buried. The lever cord is then pulled, when the catch pin is withdrawn from the plunger and the latter descends, throwing out the barbs. These as they extend press and pack the material up into the crotchets of the tines. In this position, the plunger is again caught by the catch pin; and as the bottom of said plunger rests on the barbs, the weight thereon is taken off their pivots and brought to bear on the key, F. The load is then lifted. When it is to be discharged, the lever is again moved, the catch pin withdrawn, and the weight causes the fork to descend, the plunger remaining stationary. This causes the retraction of the barbs and consequent release of the hay. The invention received an award and commendatory report at the Centennial Exposition.

Patented through the Scientific American Patent Agency, April 3, 1877. For further information relative to sale of territory, etc., address Peter Grant, Clinton, Ontario, Canada.

A Large Passenger Steamer.

The new steamboat, the Massachusetts, of the New York and Providence line, was built by Mr. Steers, of Greenpoint, N. Y. Her dimensions are as follows: Length, 325 feet; beam, 46 feet; beam, over all, 76 feet; depth of hold, 16 feet 4 inches. The frames are of white oak and locust and cedar, the floor timbers of white oak, and the top timbers of locust and cedar. The deck is of white pine. The launching weight of the Massachusetts, without the machinery or joiner work, was 1,000 tons. The engine is of the vertical beam type, with all the recent improvements. There is a 90-inch cylinder with a stroke of 14 feet. The wheels measure 39 feet 7 inches in diameter. There are two smoke pipes. The boat will be steered by steam. The interior arrangements are very handsome.

THE dreaded *hemileia vastatrix*, which has hitherto been confined to coffee plantations of Ceylon and Southern India, has at last made its appearance in Sumatra, and in all probability will find its way before long to the neighboring islands where coffee is grown.