

COMBINED SKIMMER AND FORK.

The annexed engraving represents a new instrument designed to be used for cooking purposes, and is so constructed that it may be used as a skimmer and a fork. The two parts are connected in such a manner that they may be slid back and forth upon each other, to adapt the instrument to be used as a skimmer or as a fork, as may be desired.

The skimmer is convex and perforated with numerous holes, in the usual manner. The fork is made of iron or steel wire, and the prongs and the lower part of the handle are curved upon the same arc as the skimmer. The shank or lower part of the fork passes through and slides in a keeper attached to the back of the skimmer near its rear edge. The prongs of the fork pass through holes in the skimmer near its forward edge. The prongs of the fork are made of such a length that when it is drawn back the points of the prongs may be back at least as far as the forward edge of the skimmer, and when the fork is pushed forward its prongs may project far enough for use as a fork.

Patented through the Scientific American Patent Agency, February 1, 1876, by Emerson E. Flagg, of Brattleborough, Vt.



FLAGG'S COMBINED SKIMMER AND FORK.

IMPROVED HOP CULTIVATOR.

This machine has been constructed for digging hop ground by steam power. In the best cultivated hop gardens it is the custom to dig the whole of the land by hand, in others small two-horse plows are used to plow between the rows of hops, these rows being afterwards dug by hand.

Although originally designed for use in hop grounds, the machine is well adapted for sugar plantations and other agricultural work. It is not hauled by a wire rope as steam plows or cultivators are, but is propelled by its own hind wheels which receive motion by gearing. The framework is of angle iron, and at the after end carries a three-throw crank shaft; on this crank shaft is keyed a bevel wheel which gears with a pinion on a vertical shaft; this vertical shaft carries a V pulley which receives motion from the engine by a hempen rope. In front of the V pulley are the guide pulleys, so arranged as to allow the implement to turn round without interfering with the position of the rope on the driving pulley.

The cranks work three vertical connecting rods, which are in the form of the letter T inverted; in the lower parts are fitted the tines; a radius rod is jointed to each connecting rod a short distance above this crosspiece which carries the tines; this radius rod acting as a fulcrum causes the extremities of the tines to describe an oval; as the crank shaft revolves (in a contrary direction to the road wheels) the tines enter the ground nearly vertically; as the crank passes the lower-center the tines are pushed backwards, tear the earth up, and turn it over. A train of wheels transmit motion to the road axle, on which the driving wheels run loose, but are thrown into gear by clutches worked by screws, which are tapped into the axle. The machine is steered by the leading wheels.

In setting to work, the hemp rope, which is driven from a V groove in the flywheel of a portable engine, is led round the field on pulleys and porters, and takes a turn round the driving pulley on the machine, as shown in the engraving, which we copy from *Engineering*. When the digger has made a journey up the field and arrives at the headland, the tines are lifted by the hand wheel, which depresses one arm of the bell crank; on the other end of this bell crank the forward ends of the radius rods are hung, and as it is forced back the tines are lifted out of the ground; the land-side wheel is then released by withdrawing the clutch, the inner or land-side wheel remaining stationary.

The machine and tackle are worked by three men and a boy, namely, engine driver, a man to attend to the machine, a boy to steer, and one man to move, at each bout, the anchors, which are ordinary farm wagons with pulleys fixed to them.

With an eight horse power portable or traction engine five acres can be dug per day at a depth of 9 inches.

These machines are constructed by Messrs. J. and F. Howard, of Bedford, England, from the design of Mr. J. H. Knight, of Farnham.

Testing the Gas of New York City.

Arrangements have lately been made to test the gas furnished by the several companies to New York city. The pure sperm candle, burning 120 grains per hour, is used as the standard. The principal instrument used in the tests is called a photometer, and is placed in a room, the walls and ceiling of which are painted black. The instrument consists of a 60 inch graduated bar, connecting with two sperm candles on one side, and with the gas-measuring and burning appliances on the other, comprising an ordinary wet meter, a pressure gauge, and a governor. Upon the bar is a sliding box, containing what is called a Letheby disk,

which is placed vertically to catch the light from both sides. All light is then excluded from the room. By experimenting with the disk the examiner learns, by the position of the box upon the graduated bar when the light falls with equal strength on both sides of the disk, whether the illuminating power of the gas reaches the required standard, that of 16 can-

June 26, 1877. For further information address the inventor, Mr. Isaac H. Allen, Black Creek P.O., Welland county, Ontario, Canada.

Professor S. P. Langley's New Method in Solar Spectrum Analysis.

No observation of modern physical astronomy is more striking in its conception than that which attempts to determine the motion of a celestial body by the altered wave-length of its light, and none has attracted more general attention. It is popularly understood that the proper motion of certain stars in the line of sight has been thus completely demonstrated, but those particularly engaged in such studies know how far astronomers have till very lately been from the certainty attributed to them.

It can hardly, however, be deemed superfluous to still offer, upon so important a question, the results of an independent method of measurement, and one which renders errors from instrumental displacement, on the danger of which so much stress has been deservedly laid, in the sense in which the word is here used, not only unlikely but impossible.

The theory of the proposed method is very simple. Let two spectra be formed side by side, the one of light from one edge of the sun, the other of light from a point 180° distant. The instrument being in adjustment, if these points be in the neighborhood of the solar poles which are relatively at rest, all the lines will be continuous in both spectra. But if the instrument is rotated till the light comes from points on the eastern and western sides of the sun, which are in relative motion, not only will the solar lines be discontinuous, in the two spectra: as though the one receiving light from the advancing or eastern side had been slid past its neighbor toward the violet: but any mal-adjustments of the instrument, which simulate this effect, can be with certainty detected by a means to be shortly described. The solar spectrum consists of two distinct kinds of lines, one caused by absorption in the solar, the other by absorption in the terrestrial atmosphere. These latter being formed by light from all parts of the sun are independent of its rotation.

The prisms are adjusted, till, on looking on the sun directly, the lines are all continuous in both spectra, then the instrument is put in the telescope and the slit placed at such a position-angle that the light in spectrum A comes from the vicinity of the north solar pole, that in spectrum B from the south. On looking in, we see a very long and narrow spectrum, filled with dark lines and exhibiting the chromospheric lines on both sides. It is divided by what appears to be a very fine dust line, in two exactly corresponding parts, and is in reality two distinct spectra, as we see by the opposed chromosphere lines; but as the sources of light for both spectra are relatively at rest, all the dark lines are still continuous. But now (without disturbing any adjustment), revolve the whole 90° about the optical axis passing through the center of the solar image, so that spectrum A is formed by light from the eastern or advancing edge of the sun; spectrum B by light from the western or retreating one. A curious change has taken place. By a very minute but perceptible quantity, spectrum A appears to have been slid past its neighbor, toward the violet end, so that every solar line in the first is "notched" at its junction with the second; while, at the same time, the telluric lines are as unaltered as the fixed lines of a micrometer web would be, by moving a scale about in the field. The effect is the same as though the spectra were tangible things, like two engine-divided scales, whose numerous delicate divisions (represented by the solar lines), were all in exact juxtaposition a moment before, and are all now just perceptibly displaced, as when a vernier plate is moved till a coincidence is made at a new stroke on the limb.

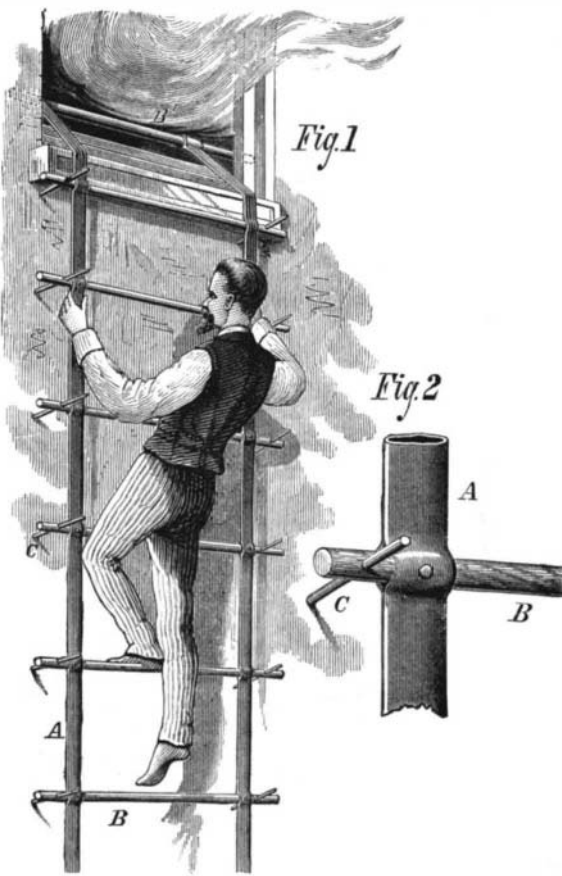
Moving the instrument 90° more, we come again into the axial line of the sun, and the coincidence should return; with still 90° more we are again in the equator, but now spectrum A is formed by light from the western edge, and this time it is moved the other way, as if it were a scale which had been slid by a very slight but distinctly perceptible amount toward the red end; while still the telluric lines retain their continuity, assuring us that no mal-adjustment has occurred.

It will be admitted that this change is, if real, excellent experimental evidence that the wave length is virtually different in light from the eastern and western limbs, as theory predicts. For, granting that the instrument is mal-adjusted in any unknown way or degree, any instrumental cause will affect solar and telluric lines alike, and we may in fact defy ingenuity to suggest an error of adjustment, which will modify one and not the other.

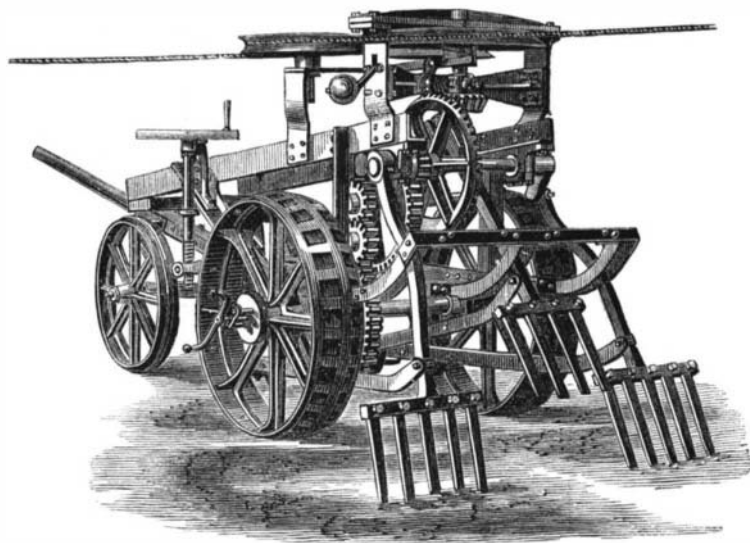
It will be remembered that many lines in the spectrum are only seen when the sun is low. These are clearly due to the absorption in our atmosphere. Many thousands, as we know, are due to absorption in the sun's atmosphere. There remains a large number of lines not coincident with any we

ALLEN'S IMPROVED FIRE ESCAPE.

The accompanying engravings represent a new flexible or folding ladder, designed as a means of enabling persons



to escape from the upper stories of burning buildings. The side supports, A, Fig. 2, of the ladder are made of webbing woven tubular or of double thickness, with openings transversely through it at proper intervals to receive the rungs,



KNIGHT'S HOP CULTIVATOR.

B. The latter have studs or arms of wood, C, fixed into their ends for the purpose of holding the ladder away from the wall, and thus insuring a good foothold to the person descending. The top round, B', is made larger than the others, so that it may extend across the window inside and thus securely sustain the ladder. It is intended that the ladder shall be kept rolled up beside the window, so that in case of fire it may at once be thrown out, when it will uncoil and be ready for use, as shown in Fig. 1. The inventor states that two or three persons may descend at once, and that the ladder constructed as above explained is capable of sustaining a weight of 1,000 lbs.

Patented through the Scientific American Patent Agency,

produce at the electrodes of our battery, and always present in the spectrum. Of these we do know that they are either caused by the sun's atmosphere or ours, without always knowing which, for these can only be inferred to be telluric from their growing stronger as the sun sets, and this, though easily determined in the case of a single line, becomes a task of great labor where we deal with thousands. It is evident, however, that after having used known telluric lines to determine the fact that the refrangibility of solar lines only is altered, we can reverse the process, and classify unhesitatingly hereafter all lines as telluric which are unaffected by the changes that compel others to betray their solar origin. To merely see these two spectra with clearness, then, is to be enabled to pick out the telluric lines from the others, as though they were mapped before us. They are mapped in fact, and it becomes, under the proper conditions, a matter of simple inspection to determine them.—*American Journal of Science and Arts.*

Communications.

Our Washington Correspondence.

To the Editor of the Scientific American:

During the last session of Congress, acts were passed authorizing the Commissioner of Patents to extend two patents, if in his judgment the applicants were entitled to it. One of these cases, that of E. T. Bussell, for a combined rubber and steel car springs, patented Nov. 29, 1853, and extended in 1867, has just been refused; the other, the Voelter wood-pulping apparatus, has not, I believe, been yet decided.

The commission to try Mr. McClary Perkins met last Monday, but the authorities having the matter in charge refuse at present to have anything to say about the proceedings, preferring to have the matter kept secret until the decision of the commission is announced.

The scientists of this city have been considerably excited over the discovery of two satellites of Mars by Professor Asaph Hall, of the Naval Observatory, with the aid of the new 26 inch refractor. It appears that the Professor really saw one of the satellites on the 11th. ult., but had no opportunity then to wait for the planet's motions, and therefore failed to recognize it as a satellite. He, however, saw on the 16th. ult., at 11 h. 42 m., a faint star near the planet, so faint that the latter had to be thrown out of the field of view in order that the former might be seen. It was nothing remarkable to find a star there, however, as there are many in the region where Mars may now be seen, but this one appeared to be following the planet, which led the Professor to particularly notice it and to carefully measure the distance between them about one o'clock. At two o'clock he made another measurement and found that the two stars kept the same distance from each other. He then stopped observations for the night; but on the next morning mentioned his observations to Professor Newcomb, who concluded that it must be an asteroid or else a satellite of Mars which has hitherto escaped notice. As it was known there was an asteroid in that neighborhood the two astronomers waited with some anxiety for the reappearance of the object, but Professor Newcomb was so well satisfied that it must be a satellite that he set to work to calculate its time of revolution, which he found to be about thirty hours. The planet could not well be seen until near ten o'clock on the night of the 17th., and this time of revolution showed that the satellite, if it was one, could not probably be seen until nearly the morning of the 18th., but if it was an asteroid it could be seen on the night of the 17th. As soon as the planet could be seen the professors were on the watch, and to their dismay they found a star just where the asteroid should be; but Professor Hall became satisfied from his measurements that it could not be an asteroid, and Professor Newcomb, seeing Mars apparently passing the object, from his calculations thought that it would surely be seen at four o'clock on the morning of the 18th. at the same place where it was discovered on the 16th. They accordingly waited, and were gratified with the sight of the star in the exact place predicted by Professor Newcomb. From this they were perfectly satisfied that the object of their observations was a satellite of Mars, and to their inexpressible gratification they shortly after discovered a second satellite. At the end of the thirty hour period, the evening of the 18th., their observations were confirmed by the reappearance of the satellite; and Mr. Todd, another of the astronomers, thought he discovered a third object, which may yet prove to be still another satellite. The following extract from the official report of Rear-Admiral Rodgers, in charge of the observatory, gives all the data relative to the position, time of revolution, etc., that has been obtained at the time of this writing:

"The first satellite has an apparent distance from the center of Mars of 82 sec., and its time of revolution around the planet is 30 h. Its magnitude Professor Hall estimates as the 13th or 14th. The plane of its orbit has now a considerable inclination to the line of sight from the earth to Mars. At its elongations its angles of position are 72° and 252°. The second satellite was discovered August 17th at 16 h. It appears to be quite as bright as the first one, and at the elongations has nearly the same angles of position, which correspond to the equator of Mars. Its apparent distance at the elongations and its periodic time are not yet known. The following are the preliminary elements of the outer satellite as calculated by Professor Simon Newcomb: Major

axis of orbit, 82 m.; angle of major axis, 70° and 250°; minor axis, 28 m.; passage of satellite through western axis, August 14, 16 h., 40 m.; the period of the inner satellite or satellites is so short, probably less than eight hours, that it cannot be fixed."

The cotton report for August, of the Department of Agriculture, makes a good showing, but a slight decline is observable over the condition as reported for the previous month, which was 93.4, the average for this month being 93. In Louisiana the promise is extraordinary. In Concordia parish the best crop since 1870 is expected; and in Union parish, "the best since 1860." In some of the Atlantic coast counties there is frequent mention of inferior fruiting; and in the Carolinas generally there has been too much succulence from too abundant moisture. In Georgia and Alabama, on the contrary, there has been injury from drought, but of late the weather has been more favorable. In some of the Mississippi bottom lands, some of the cotton has been abandoned on account of too much wet weather. Considerable complaint of the caterpillar is heard from some parts of Texas, but they do not appear to have affected the crop seriously, except in a few cases. The caterpillar has also appeared in a few places in Louisiana, Alabama, Florida, and Georgia.

The Secretary of State has received a dispatch from our Minister to Greece, in which it is asserted that the United States can now and henceforth will control to a large extent the grain markets of Europe. Russia has been our only competitor in this trade; but under the most favorable circumstances for that power the United States has had the advantage of that great cereal-producing country, as our machinery, railroad system, elevators, and simple customs regulations combined have enabled us to place our grain on shipboard at about 15 per cent less cost than the Russian shippers can handle theirs. The war in which Russia is now engaged will certainly not lessen these advantages, and with such an outlook it does not seem too much to assert that with reasonable efforts we shall control the English and some of the principal continental markets. In anticipation of this, British capitalists are now engaged in building six of the largest sized iron vessels designed expressly for the conveyance of grain on English account; and it is suggested that we should not only strain every nerve to meet the increased demand for our breadstuffs, but that we should supply ships also. It is further suggested that, if we wish to retain this trade for all time, some cheaper means of transportation than railways will be found necessary, and that if we had one or two more canals like the Erie, or if the capacity of that could be increased sufficiently, it would seem likely that we could readily retain this trade in our hands until such times as our population became so great as to readily use all our grain at home.

The river and harbor appropriation bill of 1876 appropriated \$100,000 for the improvement of the mouth of the Mississippi river, but "provided that the appropriation shall not be available whenever and so long as there shall be an open channel of eighteen feet of water at mean tide to and from the sea at the South Pass." Captain Brown, the engineer in charge, has reported to the Secretary of War that a survey has been made, showing a channel 250 feet wide and 18 feet deep, and the Secretary has ordered that further expenditure of the \$100,000 be stopped. The dredges that are working on the other passes will therefore be withdrawn. This is construed as an official acknowledgment of the success of Captain Eads' jetty system, and it must be very gratifying to him, in view of the official opposition he had to encounter before he could get his plans adopted.

Reports just received here state that the Entomological Commissioners have made an extended trip through a large region of our western territories. The observations of Professors Riley and Packard coincide in indicating that little trouble need be feared from the grasshoppers during the present year in the west. The wet, cool, backward weather has proved unfavorable for the development of the insects, and there are only a few localities where the numbers hatched are insufficient to do any damage worth mentioning. Professor Riley speaks more doubtfully about Colorado in this respect than as to Missouri, Kansas, and Iowa, on account of the greater diversity of surface and climate that Colorado affords, yet even as to that State he is very hopeful. In Minnesota and Dakota, Mr. Whitman has compiled a report of the observed flights of grasshoppers for the present year. Their directions varied in a puzzling manner, and it is difficult to draw any conclusion from the record as to their destination. Several of the flights were observed to go towards the northeast, which may account for the recent complaints from Canada of a visitation of the 'hopper. A very encouraging circumstance for our farmers is that no account of the swarms which passed over Dakota describe the insects as alighting either to hatch or feed.

Major Powell, in charge of the geological survey of the territories, states that there is but a comparatively small area of arable land now owned by the United States, and is preparing for Congress, at the direction of the Committee on Public Lands, a report to maintain his assertions. The Major's statements, however, are severely criticised by the western papers, who state that he runs an imaginary line through Minnesota, Iowa, and Kansas, separating the "arid" and the "humid" territory, west of which he says that farming cannot be successfully carried on. It is stated that the experience of thousands of settlers contradict his theories, and that even if they were correct at present, there is

no doubt that tree planting would redeem the so-called "arid" districts, as it has many other similar localities.

One of the Japanese Postal Commissioners is in this city, and has been taking observations of the working of the General Post Office, with a view to incorporate some of its features with the postal service of Japan. He was afforded every facility for carrying out the object of his visit, and appeared much pleased with what he saw.

Washington, D. C.

OCCASIONAL.

The Locusts in Kansas.

To the Editor of the Scientific American:

In answer to many questions now being asked, I would say that, from all that can be ascertained, there is no danger whatever of another general invasion of locusts into Kansas and adjacent States this fall. This has been my opinion all along, and the experience of the past two months strengthens it. The insects that developed in and arose from the country invaded last year flew, as I said they would, in a N. and N. W. direction up to the early part of July; after which their course was more irregular, and finally set in the opposite direction, namely, S. S. E. and S. W.

The country in which they hatched has been evacuated, and serious injury was confined to the extreme N. W. counties of Iowa and to Kandiyohi and some half dozen surrounding counties in Minnesota. With a few rare exceptions, the departing swarms have been light, and have vanished beyond record without doing harm. "What has become of them?" is a common question. They were mostly diseased and parasitized when they rose, and kept dropping in scattered numbers in the country they passed over, to perish without notice and without issue. The more healthy have been lost to sight in the thinly settled regions of the Northwest. Those which rose late in June and early in July from Minnesota, after flying northwestwardly, retraced their course and have lately been flying over Iowa and now over parts of Kansas. They have done no serious injury, nor do I anticipate any. Those which left Minnesota a year ago acted very much the same way; but they were followed by immense hordes from the country N. W. of Minnesota and from British Columbia, for they bred all through that region in 1876. The present year, on the contrary, all the information that I can gather indicates that the insects are not, and have not been, in noticeable numbers in these northwest hatching grounds. Dr. Packard did not find them in Wyoming, Montana, or Dakota, and there are none in Manitoba or in any of the more settled portions of British America. I expect to find the same state of things in the Saskatchewan country. From the mountain regions west of Kansas there is no danger, because the insects now developing in the higher mountain parks and passes are so relentlessly pursued by parasites and other enemies. Hence I say to all who are in the same state of mind: Plant, and leave the locusts out of account. As I have remarked elsewhere: "There is a constant struggle for supremacy between the plant-feeder and its carnivorous enemies. The Rocky Mountain locust got the upper hand during the excessively dry seasons of the early part of the present decade, and has been so numerous for the past three or four years that its enemies have rioted in plenty, and at last, in their turn, have increased inordinately. * * Nature maintains her average in the long run, and a few seasons of drought and locust ravages are apt to be followed by a period of more rainy seasons and locust decrease." C. V. RILEY.

Glyndon, Minn., August 21, 1877.

Growth of the Human Hair after Death.

Dr. Caldwell, of Iowa, states that in 1862 he was present at the exhumation of a body which had been buried two years before. The coffin had sprung open at the joints, and the hair protruded through the openings. On opening the coffin, the hair of the head was found to measure eighteen inches, the whiskers eight inches, and the hair on the breast five to six inches. The man had been shaved before being buried. In 1847, a similar circumstance occurred in Mercer county, Pa. In digging a grave, the workmen came upon the skeleton of a man that had been buried ten years. The hair was as firm as during life, and had grown to a length of eleven or twelve inches.

Copyrighted.

The Germans attribute sharp tricks to the Yankees, but following is quite as bold a swindle as any of our own. An advertisement has been circulated promising to send for one mark (25 cents) "a beautiful secret, how to become very strong," and signed M. L. Müller, in Erfurt. A person who sent the required amount received a printed slip with the following prescription, enclosed in an unpaid envelope (prepayment is still optional over there): "To become strong! Take a bottle of good red wine, bury the wine in the earth in the neighborhood of an ant-hill, and leave the wine there a whole year. Then dig up the wine again and drink some of it occasionally, and you will receive strength which will increase to your astonishment. M. L. Müller, in Erfurt." The same slip contains the usual copyright expression, "reprints forbidden," or literally "Nachdruck verboten."

"We find Mount Union College," says Chief Justice Chase, "healthful, national, making integral education attainable by all;" has superior courses, professors, museum, apparatus, board facilities, \$500,000 property benefiting its 13,097 students, who earn expenses teaching winters without losing time. For new catalogue, address Pres. Hartshorn, LL.D., Alliance, O.