

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. Flagr, 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 hempen 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.

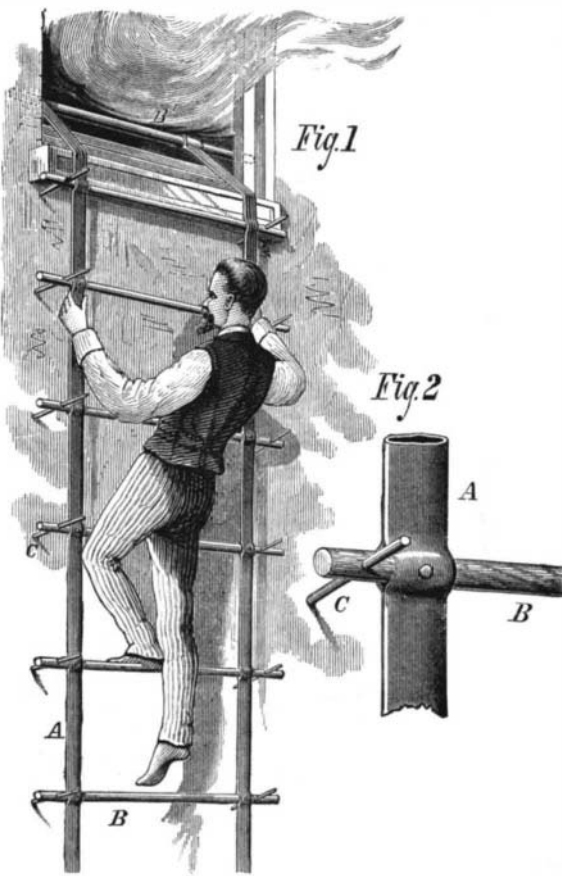
It will be admitted that this change is, if real, excellent experimental evidence that the wave length is virtually different in light from the eastern and western limbs, as theory predicts. For, granting that the instrument is mal-adjusted in any unknown way or degree, any instrumental cause will affect 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

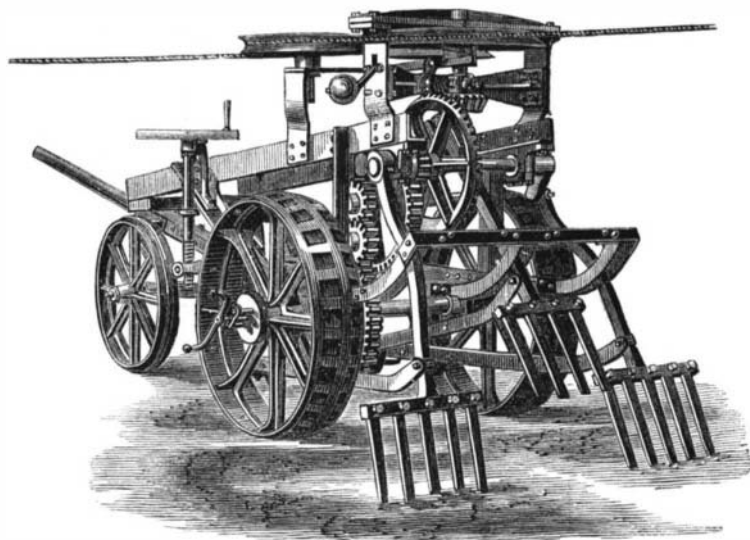
des. The gas must be used at the rate of five cubic feet per hour, and the meters show the rate at which the gas is burning.

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,