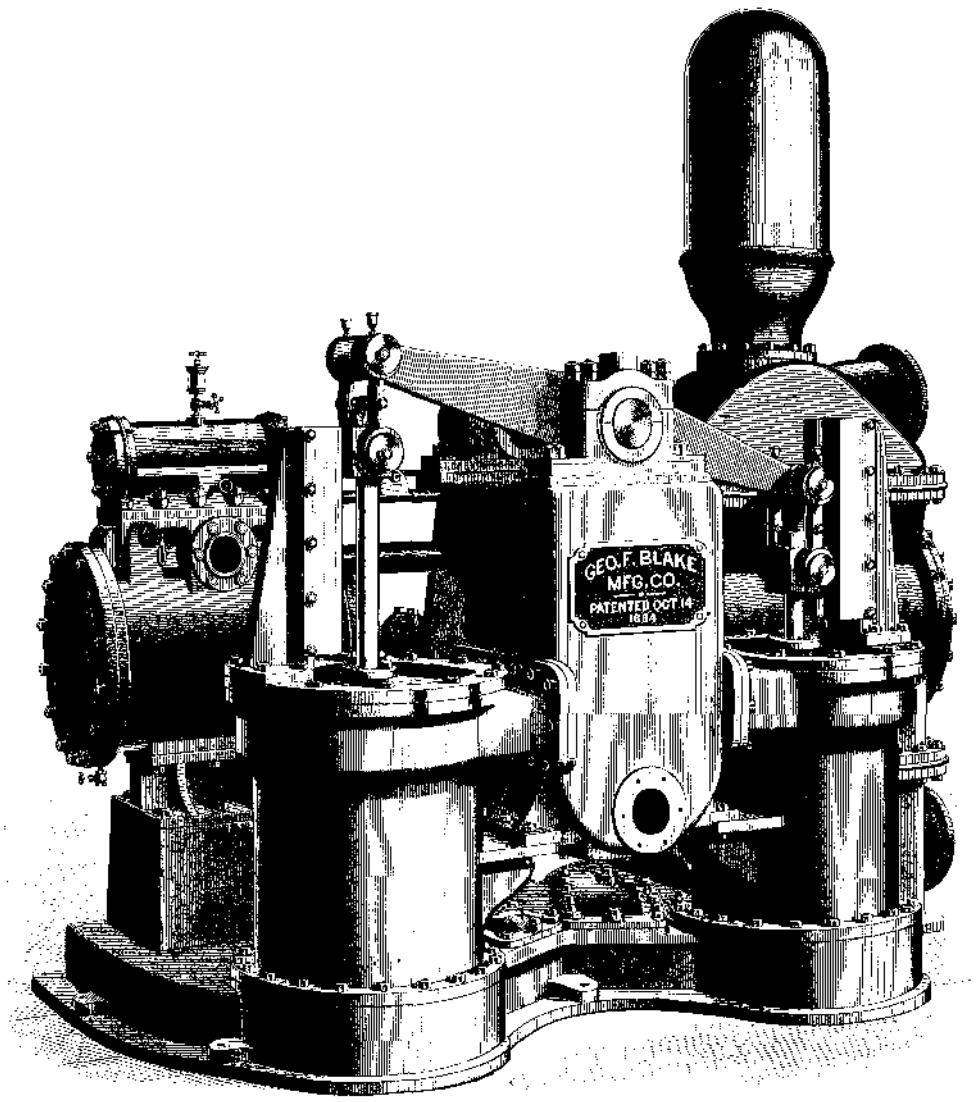
INDEPENDENT AIR AND CIRCULATING PUMPING ENGINE FOR THE UNITED STATES CRUISER CHICAGO.

The practice of using independent air and circulating pumps for marine engines was inaugurated some years ago to a limited extent in the merchant marine, but it was never carried into use in large sea-going vessels until the Naval Advisory Board took up the subject for consideration, and finally adopted this system for the new cruisers and naval dispatch boat which are being completed.

This system of divesting the engine of all pumps of every character is a great stride in economy and simplicity, as will be shown by a rehearsal of the advantages as below. It has been the common practice for many years to make the circulating pump an independent machine, either a direct acting or a centrifugal pump. Bilge pumps and feed pumps were also detached from the engines and made independent, and finally nothing was left but the air pump connected to the engine. It has now been found that to work the air pump independently is even of greater advantage. Briefly stated, the advantages gained by the use of independent air and circulating pumps are as follows: They work much more economically than connected pumps. The pump speed can be accurately regulated, according to the requirements of the main engines and the temperature of the circulating water, which latter, of course, varies with the season and climate. Pumps always work more efficiently at relatively low piston speeds; consequently, a slower speeded independent pump is much more efficient than one connected to the main engine, running at a higher rate of speed; in other words, there is much less loss by "slippage," the pumps performing nearer to their theoretical capacity. Combining the air and circulating pumps is an advantage, for the latter serves as a regulator to the former, inasmuch as it produces a steadier action, as the load on the air pump varies with the travel of the piston during its stroke. The vacuum can be maintained in the condenser while the main engines are stopped, simply by keeping the pumps traveling slowly. This is a matter of considerable importance, especially in war vessels when maneuvering, and in merchant steamers where they are continually stopping and starting during foggy weather. The vacuum being always kept up, the engine can be promptly started, and there is no danger of getting the condenser hot while the main engines are stopped. This is an incalculable advantage in ferry boats, as has been proved by the late tests on the Pennsylvania Railroad Company's boat Baltimore, a trial trip of which was reported in our columns a few weeks since. The air and circulating pumps can be used as wrecking or bilge pumps, and as their capacities are so vastly in excess of the ordinary pumps of the vessel, they become very important adjuncts to a vessel's safety. Many an engine has been broken down at sea from the air pumps not being able to withstand the racing of the engine.

The illustrations here given represent the arrangement of independent air and circulating pumps, as constructed by the Geo. F. Blake Manufacturing Company for the engines of the U. S. cruiser Chicago, a twin screw vessel of 5,000 indicated horse power.* There are two of these independent air and circulating pumping engines, one for each of the engines of the vessel.



PUMPING ENGINES FOR U. S. CRUISER CHICAGO.

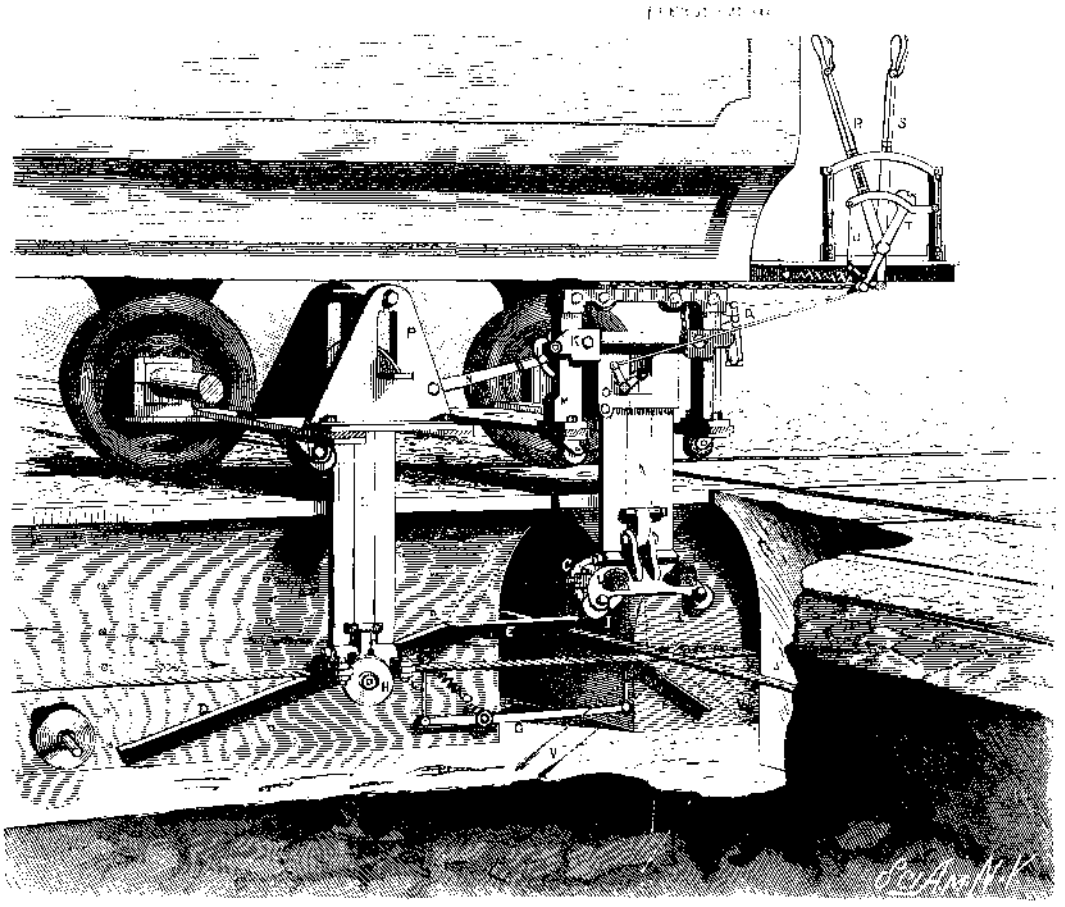
As will be readily understood by reference to the accompanying engraving, the combination is that of a double-acting horizontal circulating piston pump with two single-acting vertical air pumps. The circulating pump piston is connected directly to the piston of the steam cylinder; the buckets of the air pumps are operated from each end of a working beam, which receives its motion from a lever arm connected by a short link to the crosshead of the piston rod. The dimensions of each of these pumping engines are as follows: Steam cylinder, 20 inches diameter by 24 inches stroke; air pumps, each, 24½ inches diameter by 21 inches stroke; circulating pump, 26 inches diameter by 24 inches stroke; the capacity of circulating pump per minute, 55 gallons; diameter of injection pipe, 15 inches; diameter of discharge pipe, 14 inches; single strokes per minute, 40 to 60. It might be well to state that the dimensions of the cylinders of each of the engines of the Chicago are as follows: High pressure steam cylinder, 45 inches diameter by 52 inches stroke; low pressure steam cylinder, 78 inches diameter by 54 inches stroke. The engine will run 75 revolutions per minute, and show 2,500 indicated horse power.

The air and circulating pumps of the Dolphin are practically duplicates of those for the Chicago.

* For description of this cruiser and Dolphin, see SCIENTIFIC AMERICAN of December 22, 1883.

NEW METHOD OF GRIPPING AND CROSSING CABLES.

The accompanying illustration represents a mechanism consisting of two grips, the first of which seizes the cable to propel the car ordinarily, while the second seizes the cable during the passage of the first one over a crossing cable. As the forward grip approaches another cable, which may cross the first one at any angle, the carrying pulleys run up an inclined plane, automatically close the back grip upon the cable, and release the forward one; the car is then propelled by the back grip. As soon as the front grip has passed the crossing cable, it falls in position over its own cable, which it is made to seize by a lever, when it again propels the car. The back grip, passing up the inclined plane, frees itself from the cable, and, passing over the crossing cable, drops in position with its jaws open over its own cable ready to be called into action at the next crossing. With this grip it is easy to switch from the cable of one road and go upon the cable of another running at right angles or at any other angle to the first. The action is positive all the time, thereby rendering unnecessary the dependence upon momentum to carry the cars anywhere when the grip is loosened from the cable; curves are rounded easily and without trouble.



RAMSDEN'S METHOD OF GRIPPING AND CROSSING CABLES.

The frame supporting the parts consists of bars extending beneath the car from axle to axle, and united by cross bars. Firmly secured to two of the cross bars are two vertical hollow slide posts, M, connected at the top by a cross girt, in each end of which are two pulleys. Under the posts are pulleys placed in line with the outside ones on the cross girt. A cross head, K, formed with rectangular slotted ends, slides vertically between the posts. Chains pass from each end of the cross head around the lower pulleys, through the posts and over the upper pulleys, to adjustable eye bolts, thus forming a parallel motion for the cross head, which is reciprocated by operating the lever, S, to the lower end of which it is connected by a chain. A link is fitted at its top end to oscillate freely on the central cylindrical part of the cross head.

The lower end of the link receives the ends of a forked plate, of proper thickness to pass freely through the slot of the conduit; the joint is so formed as to permit the plate to oscillate in the link, thereby allowing of side motion of the car while rounding curves, etc., without its materially affecting the passage of the plate through the conduit slot. The closed end of the plate is curved backward and dovetailed across its face, to receive a friction block; below the dovetail it is bent still further back to serve to guide the cable to its grip when the latter falls to the normal level of the cable. On one side of the plate is a roller, C, for carrying the grip up the inclined plane, D, in the conduit. On each side of the lower part of the grip are horizontally placed rollers so disposed as to be opposite the strain of the motor when rounding curves to the right or left. At each end is a carrier pulley for carrying the cable while the car is stopped.

A short plate of sufficient thickness is dovetailed to correspond with the dovetail of the vertical plate, to which it is hinged by a bolt; the short plate fits snugly between lugs on the other, and projects above and outward from them. The end of the projection is forked to admit one end of a link, whose other end is joined to a plate, A, sliding freely between the forks of the vertical plate. The upper end of the sliding plate, A, is connected with bell cranks having their fulcrum pin in the top of the vertical plate. The opposite end of the bell cranks is attached to a rod leading to the lower end of the lever, R, by means of which the short plate or movable jaw can be operated,

The cross head, K, supports all the parts of the main grip.

To the two rear cross bars of the frame are secured triangular plates, P, slotted to receive a cross head which supports all the working parts of the auxiliary grip. The triangular plates are set wide enough apart to allow for the side motion of the car when passing curves or irregularities of the track, without impeding the passage of the grip through the slot. That portion of the auxiliary grip operating in the conduit is the same as the corresponding portion of the main grip. In the upper end of the sliding plate, B, is a spring inclosing a guide bolt attached to a block sliding vertically in the plate. To the sliding block is connected the lever, N, having at its other end a pawl, L, acted upon by a pin in the cross head, K, of the main grip.

The operation of the device will be easily understood. By operating the lever, R, the movable jaw of the main grip is closed, and the carrier pulleys are passed under to secure the position of the cable between the jaws. Then, by operating the lever, S, the main grip is raised high enough to clear the pulleys in the conduit. Simultaneously the cable is raised into the jaws of the auxiliary grip, and they are closed so as to barely grasp the cable by the connection of the lever, N, with the cross head of the main grip.

By further operating the lever, R, the jaws of the main grip are closed until the cable is firmly held. Thus by manipulating the lever, R, the cable can be sufficiently released, without its being dropped, to allow of stopping the car. Also the cable can be entirely released from both grips, and by means of the lever, S, can be instantly picked up. On arriving at the flange, D, the roller, C, of the main grip passes up, and raises the main grip and cable. When it has lifted a short distance, the pin on the end of the cross head, K, acts on the pawl, L, of the lever, N, thereby closing the jaws of the auxiliary grip firmly on the cable. At the same time a projection on the opposite end of the cross head operates the lever, Q, which, through suitable connections, releases a catch on the lever, R, which is then moved by a spring, and the jaws of the main grip are opened to drop the cable.

As the roller, C, passes on, the flanges, E and F, are closed to form a path over the crossing cable. As the cross head, K, descends, it acts on the pawl to open the jaws of the auxiliary grip; the cable is then grasped by the main grip as before. It will be seen that the car is propelled over the crossing cable by the positive action of its own cable, and under any conditions the grips are not liable to come in contact with the crossing cable. The claims of this grip have been most satisfactorily demonstrated by a model one-fourth working size.

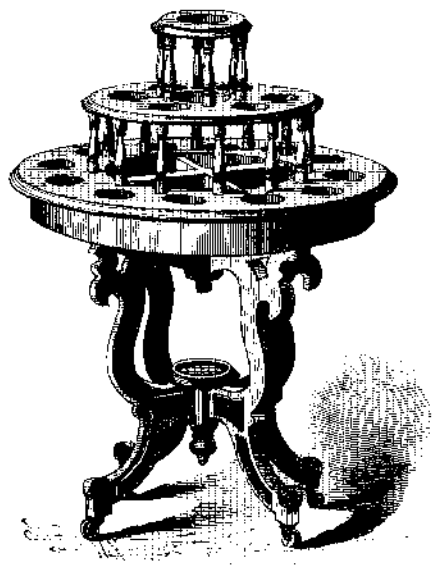
Further particulars regarding this invention can be obtained from E. C. Hine, M.D., 1834 Green Street, Philadelphia, Pa.

Hatched by a Cat.

A remarkable cat lives at No. 93 Fifteenth Street, South Brooklyn. From an early age she has displayed a great fondness for hatching out chickens. She sits on eggs like an old hen, until the feathered young break the shell, and then she cares for them as affectionately as if they were orthodox kittens. Four families of chickens have been hatched by this cat, and she is now busily engaged on the fifth, with a very fair prospect of success. The animal is the property of Mrs. Leonard, an intelligent Irishwoman, who resides with her husband in a cottage at the above address. A *Herald* reporter called at the house yesterday afternoon to see the wonder. In one corner of the kitchen, partitioned off from the rest of the room, was a large birdcage, around which a dozen chickens were strutting and picking up a meal. Inside the cage, on a bed of straw, was a cat of unprepossessing appearance, but of stalwart proportions, covering four eggs. The latter were disclosed to view as the reporter approached the cage, and the animal left her nest to play with a chicken. Then she returned to her task, extending her body at full length over the eggs and completely hiding them. The chickens she had already brought into the world seemed to possess as much filial affection as is generally shown by little chicks for their natural mothers, and they pirouetted about the cat in the most familiar way, climbing on her back, enjoying her warm coat of fur, until a movement of her body tumbled them off. After she had become weary of sitting, the cat made a tour among her young, and carried them to different parts of the inclosure. Her method of transportation was by the neck, and the chickens did not seem to mind this kind of transit any more than if they were kittens. She has been very kind to them, and has never made a meal of her offspring. It is related that when her first chicks appeared, she carried one of them by the neck up the cellar stairs. The flesh of the young biped being very tender, and the journey somewhat long, blood soon flowed. Instead of devouring the chick after she had tasted its blood, she applied her tongue daily to the neck until the wound healed. The cat came to Mrs. Leonard's house about a year ago, unheralded and unknown, and the next day was found on a nest of eggs, deserted by a hen who should have been sitting. She was driven off repeatedly, for fear she would break the eggs; but, persisting in her purpose, brought forth a brood of chickens that astonished the household. About a score of chickens have been brought into the world through her agency.—*N. Y. Herald.*

FLOWER STAND.

The top of the standard is so shaped as to receive a metal funnel, from which a tube projects downward to the top of a recess formed in the standard and adapted to receive a vessel, the neck of which fits on the lower end of the conducting tube. Cross pieces secured on top of the standard extend over the funnel, and from their intersections a pivot projects upward and through the intersections of cross pieces on a hollow circular top formed with an annular track resting on rollers pivoted in the top of the standard. On the projecting ends of the cross pieces is secured an annular trough provided with gutters leading into the upper part of the funnel. The revolving top has three



BURCH'S FLOWER STAND.

or more risers formed with holes for receiving the flower pots, which rest upon plates secured to the under side of the steps. The drip water from the pots on the two inner steps drops directly into the funnel, and the water from the pots on the outer step is led by the gutters to the funnel. The vessel to receive the drip water is not shown in the engraving.

This flower stand, the invention of Mrs. Nancy E. Burch, of Carthage, Mo., may be made very attractive in appearance; the flowers in the pots can be watered without soiling or wetting the floor, and the top can be easily turned so that each pot can be reached.

Infectious and Parasitic Pneumonia.

Mr. Germain See (*Comptes Rendus*, xix., pp. 931–3) finds that pneumonia may be epidemic, and has endeavored to see whether such attacks are distinct from ordinary pneumonia; such a view is demonstrated to be erroneous, and it is clear that there is no pneumonia due to cold; whether sporadic or epidemic, it is always parasitic in origin. The parasite is in the form of an oval micrococcus 1 μ to 1·5 μ long and 0·5 μ to 1 μ broad; it may be separate, or as a diplococcus, or in short chains of four. The capsule described by Friedlander is not regarded by See or Talamon as anything else than the result of the method of preparation. Inoculated into animals it produces common pneumonia, such as is seen in man; in many cases the microbe has extended beyond the lungs, and, by invading the neighboring organs, giving rise to pleurisy and pericarditis of the same nature as the pulmonary inflammation.

Pneumonia, then, may be considered as a specific parasitic disease, which may be reproduced in animals, but cannot be brought about by physical or chemical irritations introduced into the lungs. It may be absolutely distinguished from such other forms of acute inflammation as bronchitis or broncho-pneumonia, for in them microphytes play but a secondary role, and the first cause of them is cold. Parasitic pneumonia has a regular and definite course, just like erysipelas; its duration does not extend over nine days; for a week there is fever, which then suddenly dies down.

In fine, the course of the disease is cyclical. See has found that *antipyrine* is a specific, and that it is well to support the strength of the patient by alcohol.—*Jour. Royal Microscop. Soc*

IN France some experiments have recently been made in supplying cows with cold and warm water to test the effect on them as milk givers. The food given was the same in both cases, but it was found that those supplied with water heated to 113° F. yielded one-third more milk than those given cold water.

Finger Arithmetic.

Herr J. Menges describes, in a recent number of *Globus*, says *Nature*, the language of signs employed in trade in Arabia and Eastern Africa. This appears to have been invented to enable sellers and buyers to arrange their business undisturbed by the host of loafers who interfere in transactions carried on in open markets in Eastern towns, and it enables people to conclude their business without the bystanders knowing the prices wanted or offered. It is especially in use in the Red Sea, and its characteristic is that beneath a cloth, or more generally part of the unfolded turban, the hands of the parties meet, and by an arrangement of the fingers the price is understood.

If one seizes the outstretched forefinger of the other, it means 1, 10, or 100; the two first fingers together mean 2, 20, or 200; the three first, 3, 30, or 300; the four, 4, 40, or 400; the whole hand, 5, 50, or 500; the little finger alone, 6, 60, 600; the third finger alone, 7, 70, 700; the middle finger alone, 8, 80, 800; the first finger alone and bent, 9, 90, 900; while the thumb signifies 1,000. If the forefinger of one of the parties be touched in the middle joint with the thumb of the other, it signifies one-half, and if the same finger is rubbed with the thumb from the joint to the knuckle it is one-fourth more; but if the movement of the thumb be upward to the top instead of downward to the knuckle, it means one-fourth less. An eighth more is marked by catching the whole nail of the forefinger with the thumb and finger, while the symbol for an eighth less is catching the flesh above the nail, *i. e.*, the extreme tip of the finger, in the same way.

It will thus be seen that, by combinations of the fingers of the seller and buyer, a large range of figures can be represented. It is, of course, understood that average market value of the article is roughly known, and that there can be no confusion between, for example, 1, 10, 100, and 1,000. This language of symbols is in universal use among European, Indian, Arab, and Persian traders on the Red Sea coasts, as well as among tribes coming from the interior, such as Abyssinians, Gallas, Somalis, Bedouins, etc. It is acquired very rapidly, and is more speedy than verbal bargaining; but its main advantages are secrecy and that it protects the parties from the interruption of meddlesome bystanders, who in the East are always ready to give their advice.

Heat Consumed in a Blast Furnace.

Hanns von Jueptner, an Austrian metallurgist, has contributed to the *Chemiker Zeitung* the results of an experiment to draw up a balance sheet of the heat supply and consumption of a charcoal furnace. During the week in question the furnace was charged with 249·6 metric tons of ore, 6 tons of scrap, 26·1 tons of limestone, 106·48 tons of charcoal, and it produced 114·6 tons of pig iron, 64·6 tons of cinder, 3·275 tons of dry flue dust, and 6 tons of scrap. The average temperature of the blast was 350° Celsius; the average temperature of the gases, 127°; the mean blast pressure, 60 mm. of water; and the diameter of the nozzles of the tuyeres, 55 mm. After giving in detail the analyses, computing to a basis of 10 tons of pig iron, and calculating the heat consumed for the different purposes, Herr von Jueptner makes the following balance sheet:

A.—HEAT PRODUCED.

	Calories.	Per cent.
Hot blast	3,055,398·2	9·23
Hot materials	87,127·3	0·26
Produced in furnace	29,940,736·0	90·51
Total	33,082,736·5	100·00

B.—HEAT CONSUMED.

	Calories.	Per cent.
For chemical processes in furnace	16,521,893 5	49·94
For evaporation of moisture in stock	2,545,978·8	7·69
For melting pig and cinder	5,743,730·0	17·36
Loss of heat by dust	24,456·3	0·07
Loss by heat conducted and radiated	6,447,447·6	19·51
Loss by waste gases	1,799,230·3	5·43
Total	33,082,736·5	100·00

Measuring Heights of Trees.

A writer in *The Garden* reproduces an old but convenient method of ascertaining the height of a tree as follows:

Suppose I want to find the height of a tree which throws a shadow of 20 feet. In the first place, I should cut a stick, say 3 feet long, stick it up opposite the required tree, and measure the shadow of it. We will suppose the stick throws a shadow of 2 feet; now all I have to do is just to make a simple proportion sum of it.

Shadow of stick		Shadow of tree		Height of stick
2 feet	:	20 feet	: :	3 feet

3

2) 60

30

The height of the tree throwing a shadow of 20 feet would be 30 feet; because as 2 feet is to 3 feet, so is 20 feet to 30 feet. By this method you can measure any tree that the sun shines upon, provided there is nothing to hinder measuring its shadow.