Dec. 24, 1940. G. H. CLEMENT 2,225,905

OIL DELIVERY COMPUTING DEVICE

Filed Aug. 7, 1937 2 Sheets-Sheet 1

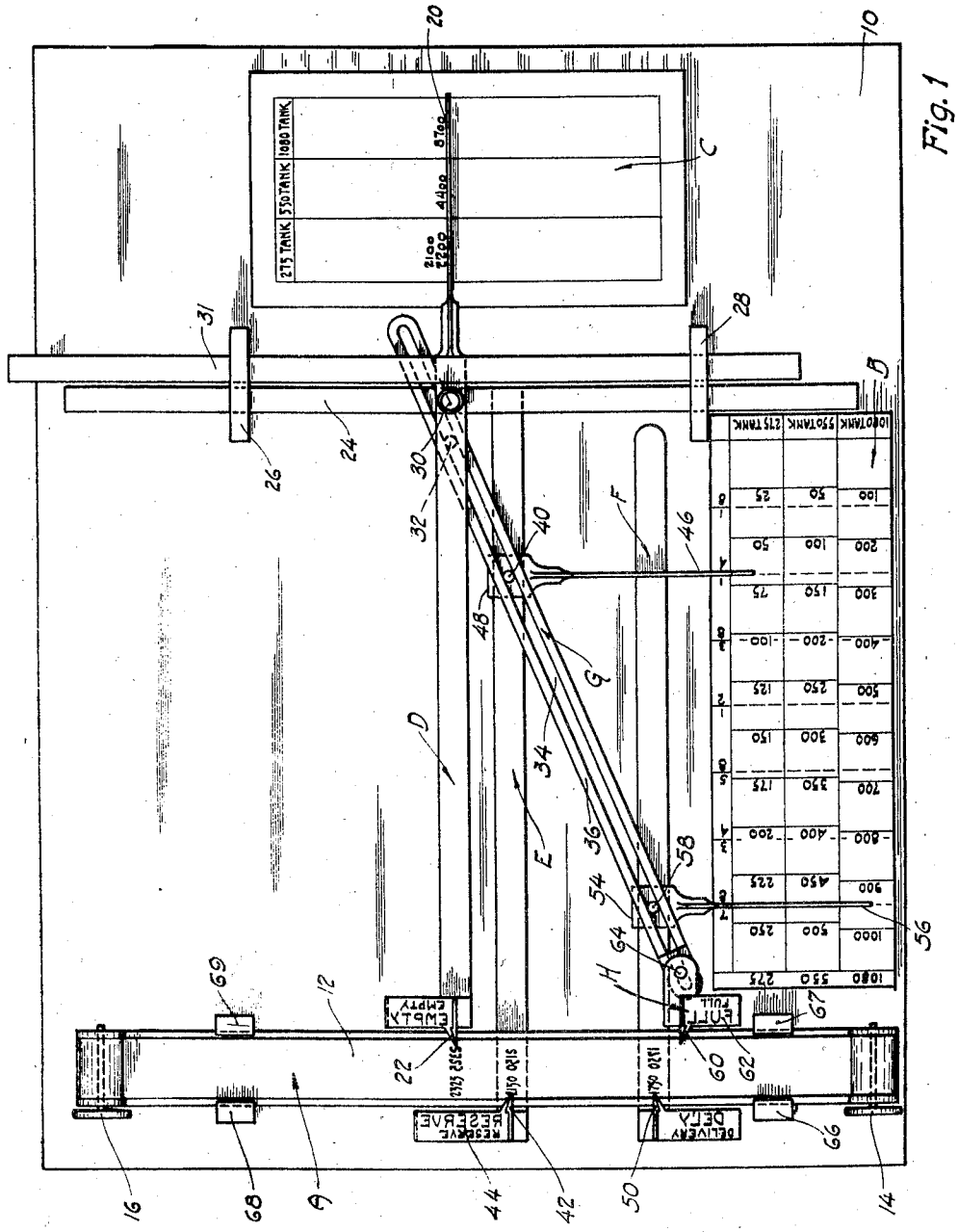


Fig. 1

INVENTOR
George H. Clement
BY
Harry Langsam
ATTORNEY

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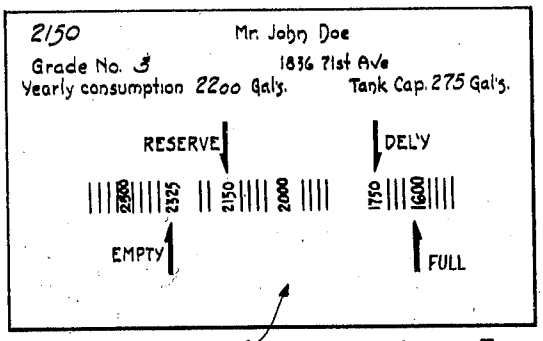


Fig. 3

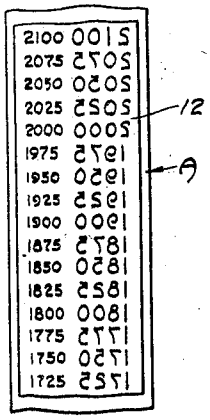


Fig. 2

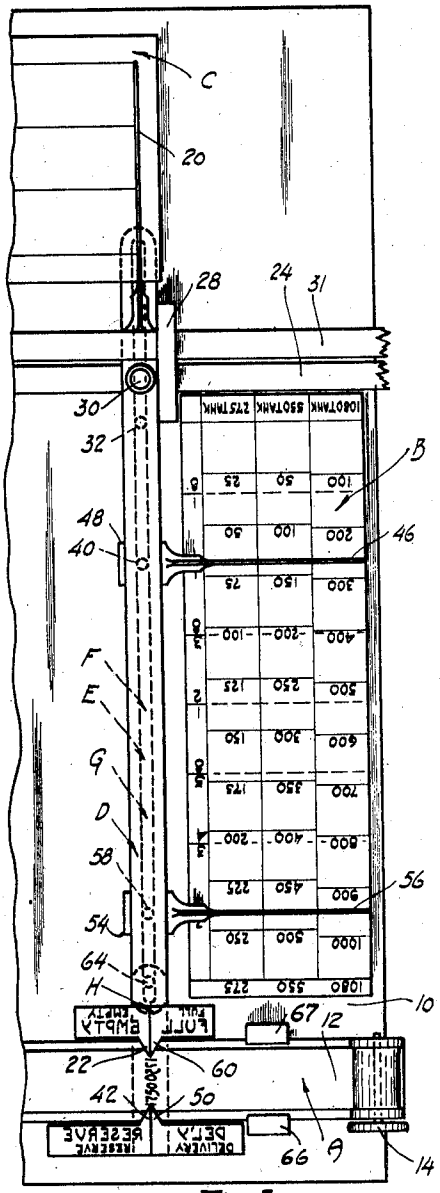


Fig. 5

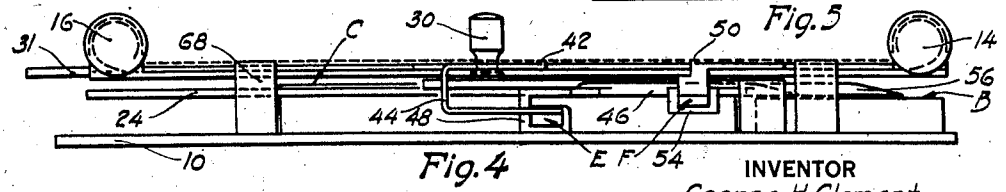


Fig. 4

INVENTOR
George H. Clement
BY
Harry Langsam
ATTORNEY

Patented Dec. 24, 1940 2,225,905

UNITED STATES PATENT OFFICE

2,225,905

OIL DELIVERY COMPUTING DEVICE

George H. Clement, Merchantville, N. J.

Application August 7, 1937, Serial No. 157,948

5 Claims. (Cl. 235—61)

My invention relates to a calculating device for ascertaining the date or time for delivery of fuel oil in homes, manufacturing plants, or institutions employing oil burners.

More specifically my invention determines, immediately following the delivery of fuel oil, the cumulative degree-days that the next oil delivery should be made.

Heretofore, calculations to determine the supply of fuel oil in the customer's tank have been made arithmetically; and because of the many variables due to different customers having different size fuel tanks, different yearly oil consumptions, and different oil reserves, the mathematical calculations are slow, difficult, and occasionally erroneous due to certain factors being omitted.

"Automatic oil delivery" is the term used where the customer gives approval for oil to be delivered any time he needs it; hence, the tank is to be filled by the oil company whenever the oil supply becomes low. Automatic delivery is desirable to the company since it permits the oil trucks to be routed in the most efficient manner, to travel on different days in certain neighborhoods with only one grade of oil, and it prevents inconvenience to the customer by keeping him amply supplied with fuel oil.

Heretofore, no mechanical calculators for use of the oil companies have been devised to approximate the accumulated degree-days when oil delivery should be made. My automatic mechanical calculator eliminates the errors which may arise when complex mathematical calculations are made to determine when oil delivery should be made to the customer.

It is, therefore, an object of my invention to construct a mechanical device whereby predetermined fuel oil deliveries may be calculated.

Another object of my invention is to provide a device which will enable one immediately following an oil delivery to predetermine the degree-days on which the next fuel oil delivery should be made.

Another object of my invention is to provide a device wherein the operating levers are few in number and easily operable.

Another object of my invention is to provide a calculator wherein the results are rapidly and directly obtained.

A still further object of my invention is to provide a calculator which will permanently and directly imprint the results upon cards which may be filed—the cards to be used at a later time for purpose of reference.

A still further object of my invention is to provide a calculator where the scales or charts are easily and directly readable by the operator.

Other objects of my invention are to provide an improved device of the character described, which is easily and economically produced, and which is sturdy and compact in construction.

With the above and related objects in view, my invention consists in the details of construction and combination of parts as will hereinafter be more fully described and which will be more readily understood when the description is read in conjunction with the accompanying drawings, in which—

Fig. 1 is a plan view in computing position of a calculator embodying my invention.

Fig. 2 is a fragmentary enlarged view of a degree day scale.

Fig. 3 is a card, for the files of the oil company, but with the final results as made by the calculator imprinted thereon.

Fig. 4 is a side elevational view of the device illustrated in Fig. 1.

Fig. 5 is a fragmentary enlarged plan view of Fig. 1 with the calculator in its initial or non-computing position.

The hereinbelow description is by way of a synopsis of the elements comprising my invention and an effort on my part to briefly recite the coordination of all the elements in a generic manner before I describe the elements and their function in more specific detail.

In this application the term "degree-days" will be used to designate the difference between an arbitrary number 65 and the daily average outdoor temperature in degrees less than 65°. The numeral 65 is merely an arbitrary number. As an example, if the average day temperature is 60°, then the "degree-days" is 5, which represents the difference between 65 and 60.

Referring now to the drawings, a degree-day scale, generally designated as A, is located on the left-hand portion, as Fig. 1 is viewed, of a base 10 of the calculator. The degree-day scale A contains numbers designating the sum of degree-days from the beginning of the cold season until the end of the cold season in equal variations. At the lower center portion of the fuel oil delivery calculator is a fuel oil tank proportionate capacity scale, generally designated as B, and on the right-hand portion of the fuel oil delivery calculator is a yearly fuel oil consumption scale, generally designated as C.

Cooperative with the cumulative degree-days scale A and the yearly oil consumption scale C

is a horizontally positioned pointer or index bar D, which is vertically movable. Parallel to the bar D is a second or index bar E, which is cooperative with the cumulative degree-days scale A and the proportionate tank capacity scale B, and parallel to bars D and E is a third vertically movable bar F which also is coordinated with the cumulative degree-days scale A and the proportionate tank capacity scale B. A diagonally positioned or hypotenuse bar G suitably coordinates bars D, E, and F, and the bar G pivots about a pointer or index H.

Referring now to the specific details embodying my invention, the degree-days scale A is mounted upon a board 10 and comprises a strip of parchment or rubber or other suitable material 12 having a consecutive series of ascending numbers which can be read quickly and also a complementary series of reverse numbers thereon, which reverse numbers can be inked and pressed upon a card so that the numbers will read in their correct position on the card rather than in their reverse position. Scale A contains a series of numbers in ascending arithmetical progression, and the numbers represent accumulated degree-days.

Each end of the degree-days strip 12 is mounted on a supply roller 14 and a take-up roller 16. Each of the rollers 14 and 16 is capable of being revolved manually by the operator. The numerals borne by the scale A range from one to the total number of degree-days there will be from the beginning of one season to the end of that season.

As an illustration of the operation of my invention with respect to the time, I rotate the chart A having aggregate degree-day markings thereon. I shall assume that the degree-day temperature at the beginning of the cold period is five, and the degree-day temperature of the second day is fifteen; thus, fifteen plus five equals a total of twenty degree-days. The numeral 20 is on chart A. Assume further that oil delivery is made on that day when the total degree-days is 20; then the chart A is moved until the numeral 20 on chart A coincides with index 50, because of the fact that delivery is made on that "cumulative degree-day." As shall be hereinafter further described, the total degree-days when the next oil delivery preferably should be made will be printed on a card J or read by the operator after the other required factors are known. This cumulative addition of the degree-days determines the point to which the scale is rotated by the turning of the rollers 14 and 16 each day throughout the winter, fall or spring.

The indicia B has the proportionate tank capacity in fractions and also in gallons; hence, the same indicia may be used for different size tanks of general use. That is, the marking 275 indicates a tank that will hold 275 gallons of fuel oil, the marking 550 means a tank of 550 gallon capacity, etc.

On the 275 tank designation is a series of markings which indicate the number of gallons of fuel oil in the tank, that is, from 25 to 275. On the upper side are spaces which indicate the fractional amount of oil in the tank to the full tank capacity as ⅛, ¼, ⅜, ½, ⅝, ¾, and full. The 550 gallon tank and the 1080 gallon tank capacities are appropriately arranged alongside of the 275 gallon tank indicia. Any other size tanks may also be placed on the chart B.

The total oil consumption chart C is a chart having the total number of gallons of oil ordinarily consumed per year by the customer. At this time it is advisable to note that the amount of oil consumed is generally controlled by the outside temperature, and the frequency of delivery depends on the size of the fuel oil tank. As an example, if a customer consumes 2000 gallons of oil a year, his fuel oil consumption is normal and a 275 gallon tank is sufficient to store a suitable quantity of fuel. Whereas if a party having a 275 gallon tank consumes 5000 gallons of oil a year, it is obvious that more deliveries must be made to the greater consumer of oil than to the lesser consumer of oil.

Therefore, an arbitrary factor, designated as K, may also be used in place of the total oil consumption. The factor K may be defined as total degree-days (D. D.) divided by the total fuel consumption in gallons (gallonage) per year; expressed mathematically

$$K=\frac{D.\ D.}{\text{gallonage}}$$

In other words, K represents the degree-days per gallon of fuel; that is, the amount of fuel oil consumed for one degree-day represented by the factor K, and if the K factor is known for each consumer, this factor can be used on the C scale.

The indicator bar D, mounted so that it moves only in a parallel direction to the bottom edge of the board, has a right-hand index 20 which points to the chart C, and an index 22 mounted on the left-hand end of bar D points to the cumulative degree-days. Adjacent the index 22 is a rubber pad which has in raised inkable letters the word "Empty" printed thereon.

The index 22 points to the numeral designations on the scale A, which indicates the cumulative degree-days when all the oil in the tank would be consumed, that is: the pointer indicates the degree-days when the oil would be consumed so that the oil company which keeps a record in their office of the degree-days and the date know the particular degree-days when all the oil in the tank would be consumed.

The index 20 is moved over the member indicating the total oil consumption of that particular installation. Expressed differently, when bar D is moved, it is moved in a vertical direction by virtue of guide bar 31 so that its index 20 points to the scale C which indicates the quantity of fuel oil consumed per year or the factor K on scale C. The factors K or the total yearly oil consumption on the scale C are not uniformly spaced apart but are located at points predetermined from actual results on similar installations.

The bar D also has a guide bar 24 rigidly affixed thereto, and the guide bar moves in vertically aligned bearings 26, 28. The guide bearings 26, 28 may be dispensed with provided other suitable guides are employed. A handle 30 on the bar D enables the operator to easily move the bar D and its coordinated bars upwardly or downwardly.

A stud 32 located near the right-hand side of the bar D projects downwardly and interfits with the slot 34 defined by the parallel spaced bars 36, 38 of the hypotenuse or diagonally positioned bar G. The diameter of the stud 32 is substantially equal to the space between the bars 36, 38 so that movement of the bar D and its stud 32 will always move the bar G, particularly since the lower pivot point about which bar G moves is fixed.

Upon movement of the bar D, the bar E is likewise moved because a small cylindrical stud **40** rigidly affixed to carrier **48** also interfits with the space **34** of the bar G in the same manner as the stud **32** interfits with space **34**, and since the stud **40** moves, it moves the bar E parallel to the bar D. The parallel movement of bar E with respect to bar D occurs because of suitable guides (not shown) which guides compel the bar E to move in a predetermined direction.

The bar E has at its left-hand side an index **42**, which points to the cumulative degree-days on the scale or chart A. Beside the index **42** is a rubber stamp or other card imprinting device **44** with the word "Reserve" thereon. The term "Reserve" indicates the degree-days when the reserve oil supply is started to be used, and it is after this "Reserve" period that a fuel oil delivery should be made.

An index **46**, cooperative with the chart B, is carried by a spring tensioned grooved carrier **48**, which is manually operated to slide upon the bar E, and the stud **40** is also affixed to the carrier **48**. The spring tensioned carrier **48** is mounted so that it will not idly slide from side to side and will retain its position on the bar E unless moved by the person operating the device. The index **46** points to the fractional capacity of the tank which is arbitrarily selected as the "Reserve" in the tank. As an example, in Fig. 1 index **46** lies over the "¼" designation which indicates that one-fourth of the total capacity of the tank is considered to be the reserve supply.

It should be observed that a certain ratio exists between the percentage of reserve oil in the tank and the total consumption of oil, which ratio is determined by the indexes **22** and **42** pointing to the degree-days on the chart A.

The horizontally located bar F mounted in suitable bearings or guides moves in a vertical direction and carries an index **50** which points to the cumulative degree-days on the chart A. Besides the index **50** is a rubber stamp or imprinting device **52** with the word "Del'y" thereon, meaning the cumulative degree-days on which delivery of fuel oil was last made. The index **50** points to the cumulative degree-days on the scale A when oil delivery has been made. Bar F carries a slidable spring pressed grooved carrier **54** which has rigidly attached to the carrier **54** an index **56**, the latter being cooperative with the chart B. This index points to the amount of oil in the tank at the time of the fuel oil delivery, and designates whether or not the driver has properly left enough fuel oil. If an insufficient supply is left, it means that more trips must be made, and additional trips mean higher costs to the oil company.

A stud **58**, rigidly secured to the carrier **54**, interfits with the slot **34** in the rod G and serves to elevate the bar F when the bar D is moved, and when the bar D is moved downwardly, the bar F also moves downwardly; and this always occurs because the pointer **56** is usually not placed over the 100 per cent mark of scale B. The stud **58** slides against a portion of the spaced bars **36**, **38** within the slot **34**.

The left-hand end of the bar G slides about a pivot **64** which is mounted upon a fixed bar H that has a cumulative degree-days pointer **60** and a rubber stamp or imprinting device **62** with the word "Full" thereon. The bar H cannot move and points to the graded series of degree-days on chart A. If the tank is filled when the driver delivers the oil, then the degree-days on "Full" and "Del'y" pointers **60** and **50**, respectively, will be the same.

If the driver does not completely fill the tank, then the pointers on the "Del'y" index and the pointers on the "Full" index will not coincide, and the difference in degree-days between the two pointers will merely be an indication as to the number of degree-days that would be taken care of if the driver had filled the tank. Under ordinary conditions, the index H could be eliminated.

It may be observed that the bars D and H control the position of hypotenuse bar G since they hold a fixed point **64** and a movable point **32**. Since three factors are known, to wit: the total oil consumption, the fraction of reserve, and the percentage of oil in the tank at the start, the two unknown factors can be solved. These automatically computed unknown factors are: (1) total degree-days when the tank will be empty, (2) cumulative degree-days when the reserve supply is called upon. Hence, the operator merely needs to look at the weather chart giving the cumulative degree-days, and he will know whether delivery should be made at once as in the case of an emergency or on the regular route.

As an example of the operation of my invention, let us assume that John Doe of 1955 71st Avenue has a 275 gallon fuel oil tank, and the driver has made a delivery of oil so that the tank is approximately seven-eighths filled. The card also shows that the approximate yearly consumption of oil is 2200 gallons. Then when the operator of the calculator receives the delivery card J from the driver, he moves the index **46** so that it is over the "¼" designation on scale B; the index **56** is moved so that it is over the "⅞" designation on scale B; and handle **30** is grasped and moved by the operator until the index **20** is over the "2200" designation of the chart C. Let us further assume that the oil delivery was made on a day when the cumulative degree-days was 1750. Under such conditions the scale A will be shifted until the marking 1750 is opposite index **50** or "Del'y." The card is then placed so it is between guides or rests **66**, **67**, **68**, and **69**, and then has the numerals of degree-days imprinted thereon and the designations "Empty," "Reserve," "Del'y," and "Full" pointing to different degree-days. Further assuming that the cumulative degree-days numeral is "2150" beside the word "Reserve," then the card is placed in a file where the cumulative degree-days of 2150 is placed. In other words, when the cumulative degree temperature becomes or approaches 2150, the supplier will known that it is time to inform the driver of the delivery truck to stop at John Doe's home on his regular route delivery and fill the oil tank.

John Doe's card is then applied to the calculator in the same way as was done in the aforementioned description remembering, of course, that the cumulative degree-days have changed as the days having degree-days pass.

Although my invention has been described in considerable detail, such description is intended as illustrative rather than limiting, since the invention may be variously embodied, and the scope of the invention is to be determined as claimed.

I claim as my invention:

1. An automatic fuel oil delivery calculator comprising a cumulative degree-day chart, a total fuel consumption chart parallel to and spaced apart from said degree-day chart, a member movable transverse to said charts and having an index at one end pointing to said degree-day

chart and an index at the other end pointing to said total fuel chart, a pivot on said movable member and being located adjacent said total fuel chart, a fixed pivot member adjacent the lower end of said degree-day chart, an hypotenuse member both slidable and pivotable upon said fixed pivot and slidable upon said pivot on the movable member, and a third index member pointing to said degree-day chart to indicate the degree-day when fuel oil should be delivered, means whereby said third index member will move in a direction parallel to said transverse member, and means between said hypotenuse member and said third index member whereby pivotal movement of said hypotenuse member will vary the position of said third index member along the degree-day chart.

2. An oil fuel supply calculator comprising a scale having a progressing series of cumulative degree-days thereon; a second scale having different values of total consumption of fuel oil per year as one side of a right triangle; a third scale having fractional amounts of the fuel in the tank to the total oil capacity of the fuel tanks as the base of said triangle, said third scale being divided into intermediate amounts from the empty to full positions, means having indexes to point to said scales wherein the known factors are (1) amount of oil in the tank to tank capacity, (2) approximate oil consumption per year, (3) the fractional amount of oil in the tank to tank capacity when fuel oil delivery is to be made; said degree-days scale being substantially parallel to said total fuel consumption scale; a hypotenuse member pivotally connected adjacent the full position of the third scale; a bar adapted to be movable in a direction which is parallel to the base of the triangle, a pointer simultaneously slidable upon said hypotenuse and upon said bar, a pointer on said bar being adapted to be positioned over said second scale; and an index on said parallel bar pointing to the degree-days on said degree-days chart whereby the degree-days indicated is the degree-days when the fuel supply within the tank is to be replenished.

3. An oil fuel supply calculator comprising a board having a cumulative degree-day chart at one side of the board, a total fuel consumption chart parallel to said degree-day chart and forming one leg of a triangle, a gallon proportionate chart located transversely of said degree-day and of said total fuel consumption chart to be the base of said triangle, a fixed pivot located adjacent the lower end of said cumulative degree-day chart, a straight index pointer bar located over said board and having an index pointing to said total fuel consumption chart and an index pointing to said degree-day chart, a pintle on said index pointer bar located adjacent said total fuel consumption chart, a diagonal bar connected between said fixed pivot and said pintle on said index bar and being arranged for both pivotal and sliding movement on said fixed pivot and for sliding movement on said pintle, said diagonal bar movable upon movement of said index pointer bar, and a second bar being located parallel to an index pointer bar and having indexes pointing to said degree-day chart and to said gallon proportionate chart, said last-named second bar being movable upon said diagonal bar whereby the degree-day when oil should be delivered is indicated, and means whereby said second bar may move upon said diagonal bar.

4. An automatic fuel oil delivery calculator comprising a degree-day chart, a total fuel consumption chart forming one leg of a right triangle and parallel to said degree-day chart, said degree-day and said fuel consumption charts being substantially spaced parallel to one another, a bar having a pointer at each end thereof, one of said pointers cooperative with said degree-day chart and the other pointer cooperative with said fuel consumption chart, a fractional fuel oil capacity tank chart forming a second leg of the right triangle, an hypotenuse member, means whereby said bar pointers move simultaneously in a rectilinear direction, means for locating the position of said hypotenuse member, said means comprising a fixed pivot and a movable pivot adjacent the total fuel consumption chart on said first-named bar, and means movable upon said hypotenuse member, said means including a pointer movable over the fractional oil capacity tank chart and a pointer over the degree-day chart whereby movement of the pointer over the fractional oil capacity tank chart along the hypotenuse member will carry with it the pointer over the degree-day chart thereby indicating the degree-day when fuel oil should be delivered.

5. A fuel oil calculator comprising a chart serving as the base of a triangle, said chart having a fractional amount of the fuel in the tank to the total oil capacity of a fuel tank from the empty to the full positions; a second chart serving as the vertical leg of the triangle having the total fuel consumption per year thereon; a third chart substantially parallel to said second chart, said third chart having an arithemetical progression of degree-days thereon; a hypotenuse member of said triangle pivoted at the full point of the fuel tank capacity chart; a movable bar parallel to said base; a slidable member being slidable simultaneously on both the hypotenuse member and said bar; an index on said bar and pointing to said degree-days chart whereby it will indicate the degree-days when fuel delivery has been made, a pointer affixed to said slidable member and pointing to said first-named chart to indicate the fractional ratio of fuel in the tank and its actual capacity that the oilman has left in the tank; a second bar parallel to said first-named bar, an index on said second bar and pointing to said degree-days chart to indicate the degree-days when the reserve supply of fuel is reached, a second slidable member being adapted to slide upon both the hypotenuse and said second bar simultaneously, a pointer on said second slidable member pointing to said first-named chart to indicate when the reserve supply of fuel is reached, a third bar parallel to the base and the other two bars, means whereby said third bar is slidable only on said hypotenuse, and an index on said third bar pointing to said total consumption chart, said third bar locating the vertex of said triangle.

GEORGE H. CLEMENT.