No. 733,626. PATENTED JULY 14, 1903.

J. M. CORY.

COUNTER AND INDEX.

APPLICATION FILED AUG. 2, 1902.

NO MODEL. 4 SHEETS—SHEET 1.

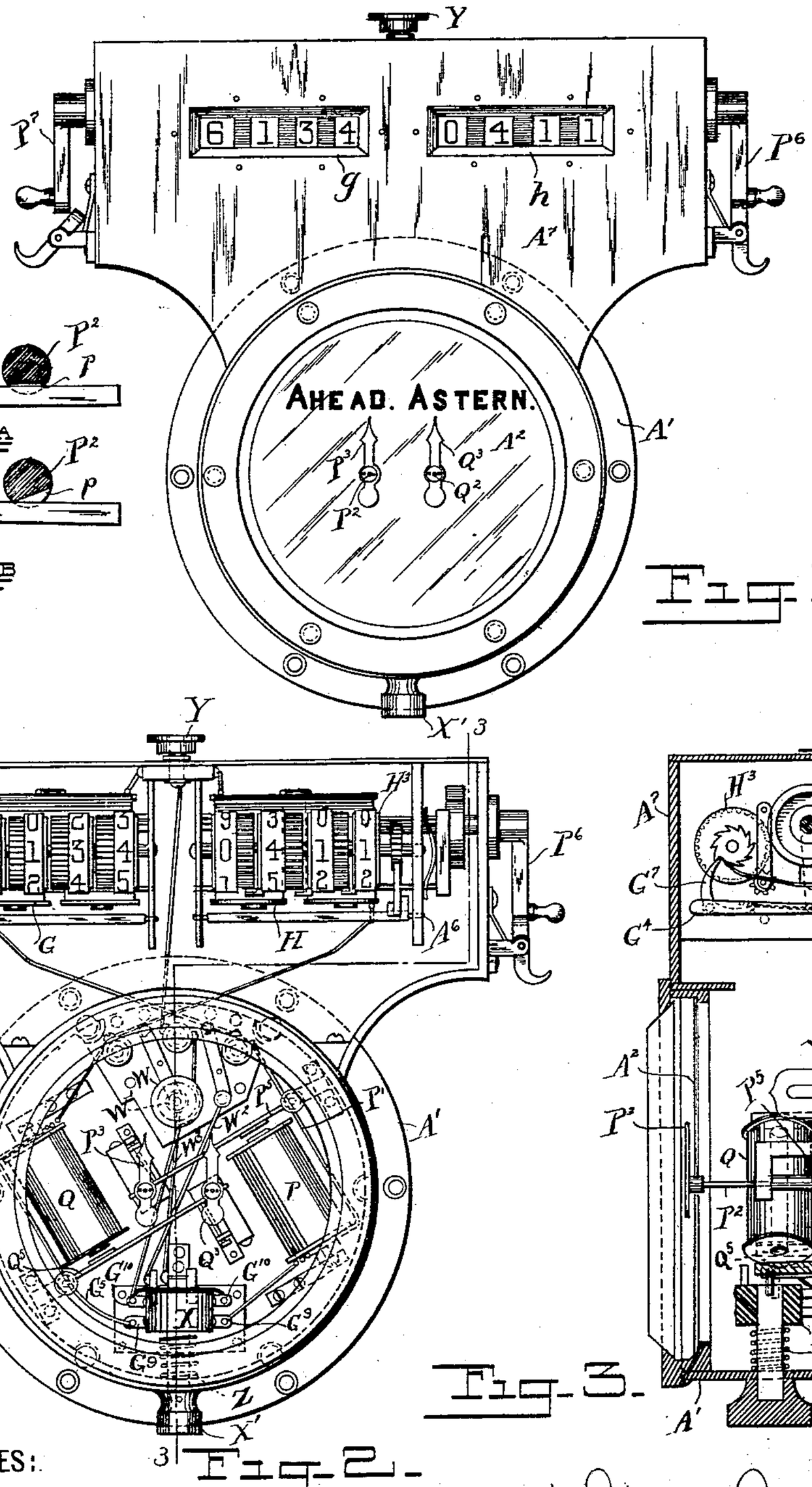

Fig. 1.

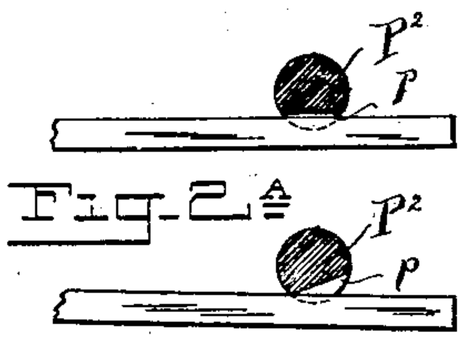

Fig. 2A

Fig. 2B

Fig. 2.

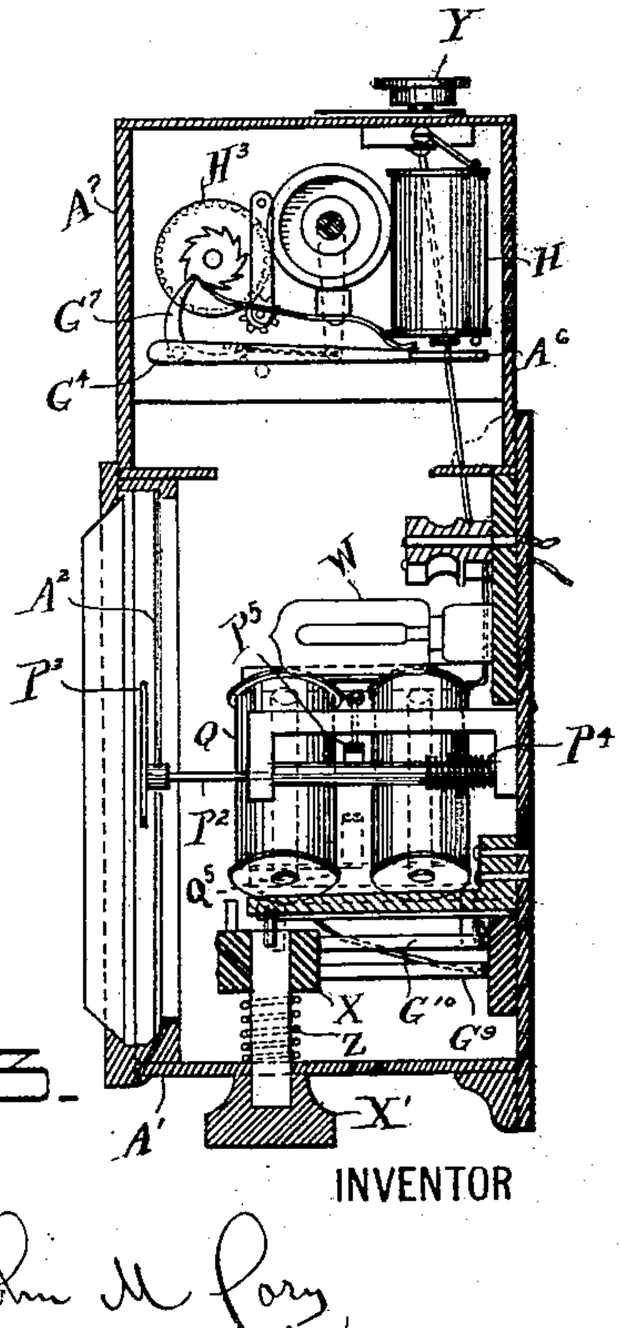

Fig. 3.

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NO MODEL. 4 SHEETS—SHEET 2.

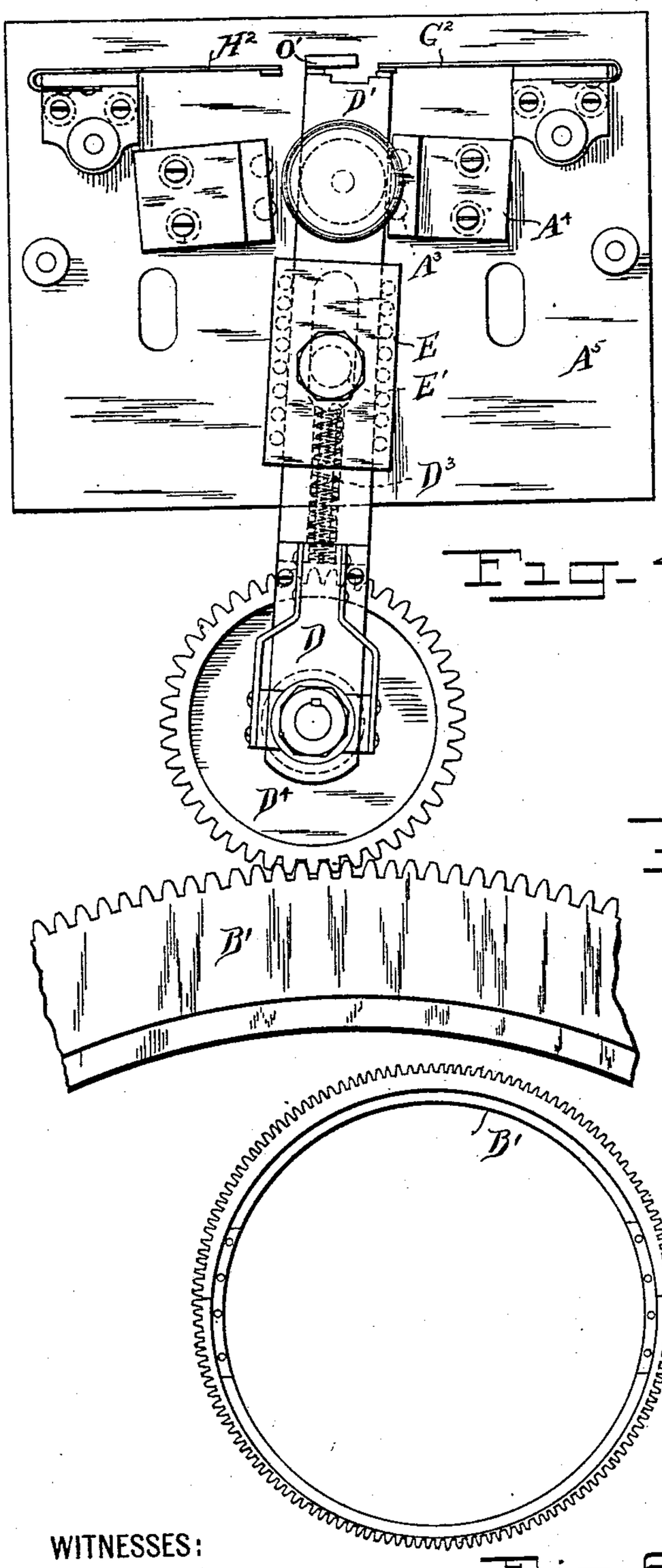

Fig. 4.

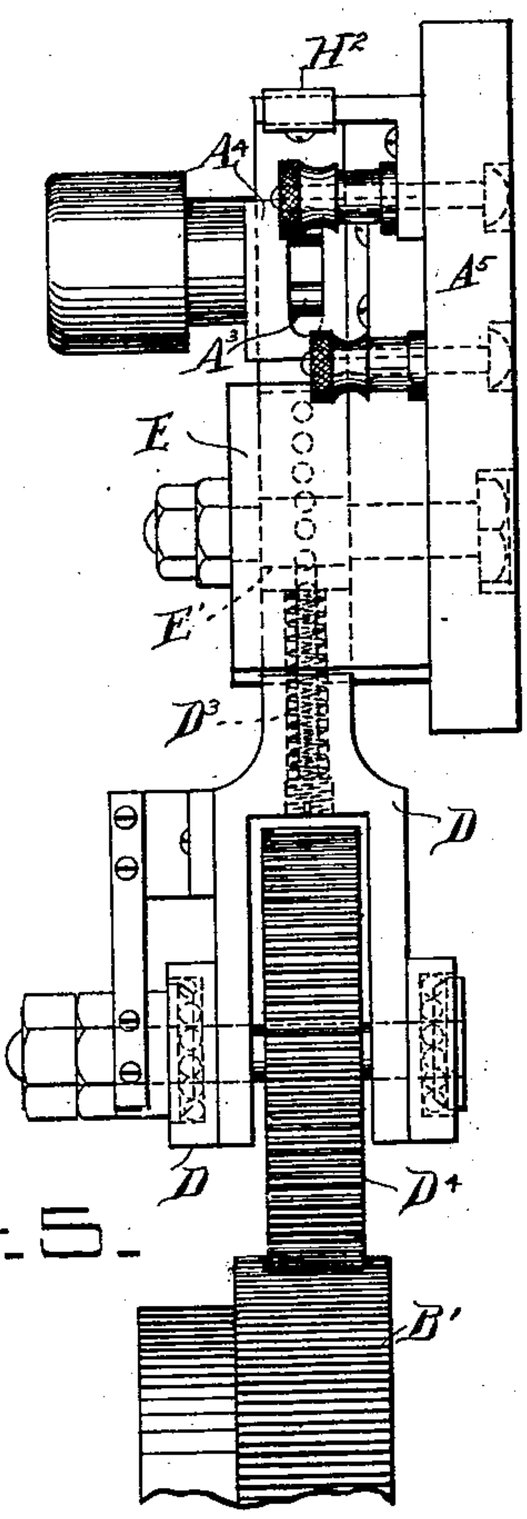

Fig. 5.

Fig. 6.

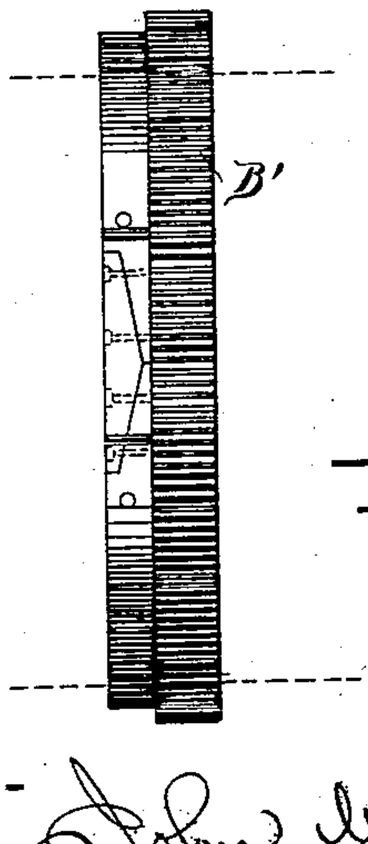

Fig. 7.

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NO MODEL. 4 SHEETS—SHEET 3.

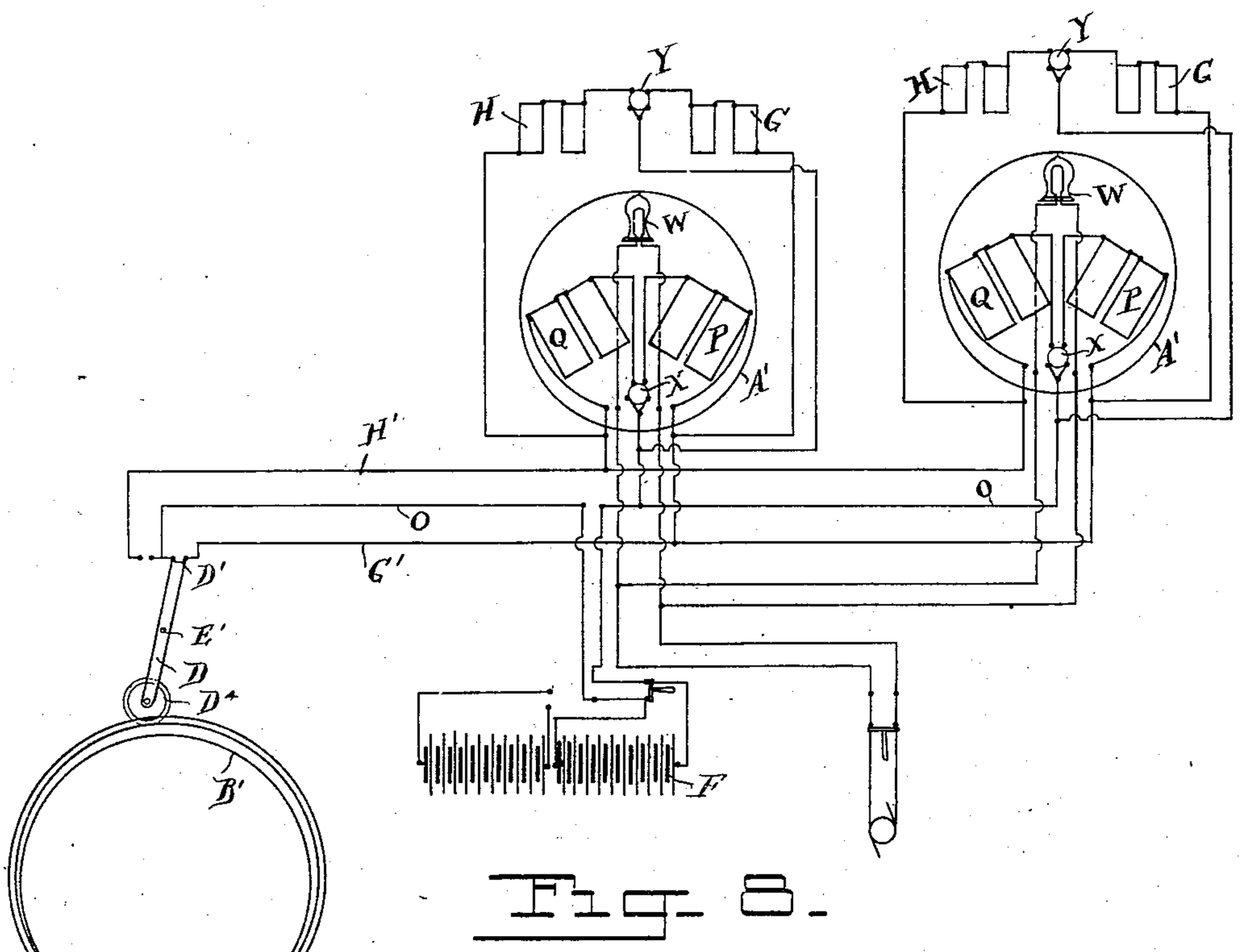

Fig 8.

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NO MODEL. 4 SHEETS—SHEET 4.

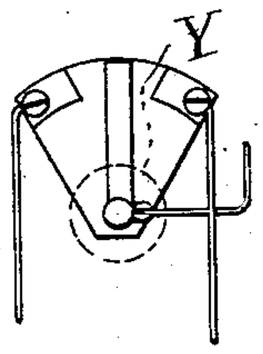

Fig. 10.

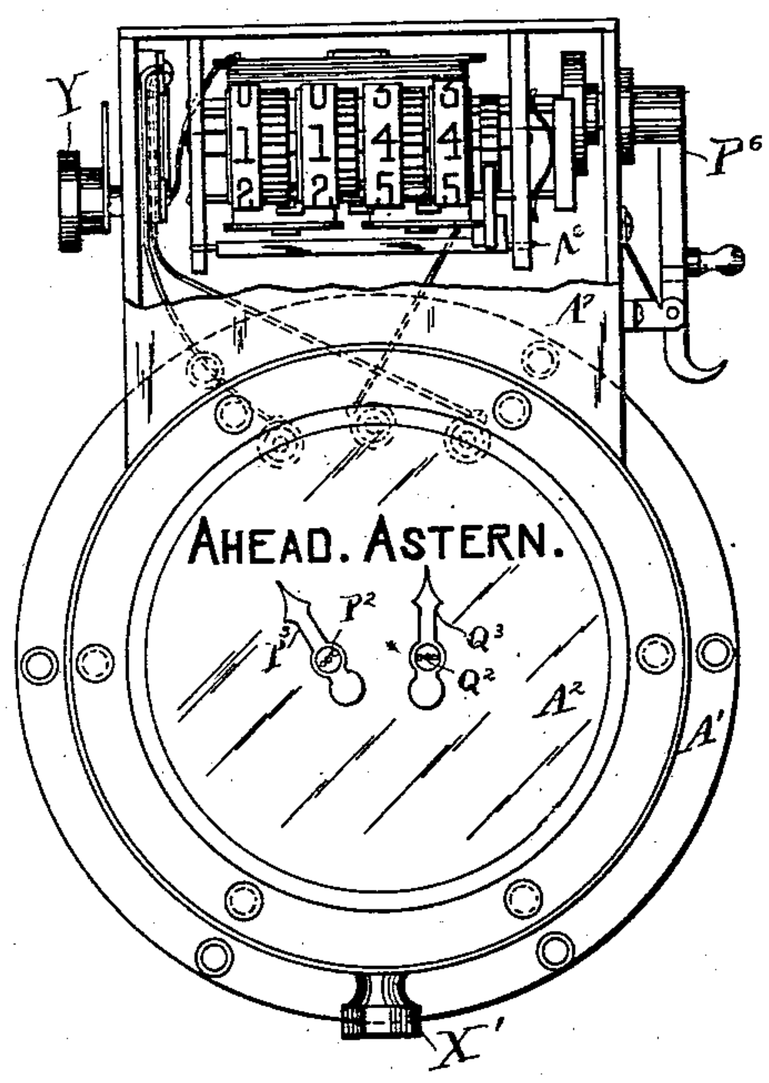

Fig. 9.

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UNITED STATES PATENT OFFICE.

JOHN M. CORY, OF NEW YORK, N. Y., ASSIGNOR TO CHARLES CORY & SON, OF NEW YORK, N. Y., A FIRM.

COUNTER AND INDEX.

SPECIFICATION forming part of Letters Patent No. 733,626, dated July 14, 1903.

Application filed August 2, 1902. Serial No. 118,118. (No model.)

To all whom it may concern:

Be it known that I, JOHN M. CORY, a citizen of the United States, residing in the borough of Manhattan, in the city and State of New York, have invented a certain new and Improved Counter and Index, of which the following is a specification.

The apparatus is intended more especially for use on naval and other ships driven by steam, and I will describe it as thus applied.

A portion of the apparatus is in contact with the shaft of the engine, being duplicated if there are two shafts, and another portion or portions, of which there may be several, in distant portions of the ship, is electrically connected.

The apparatus combines and operates from a single moving part at the engine counting mechanism to show the number of revolutions in each direction and operates indexes to show the direction in which the shaft is being revolved at any moment when it is observed, and by inspecting for a little period the index shows how rapidly the several revolutions succeed each other. I have devised novel apparatus by which these ends are attained.

The several novel elements and combinations will be fully described below and pointed out in the claims.

The following is a description of what I consider the best means of carrying out the invention.

The accompanying drawings form a part of this specification.

Figure 1 is a front view of the dial and plate. Fig. 2 is a corresponding view with the dial and plate removed. Fig. 3 is a vertical section of the case on the line 3 3 in Fig. 2. Fig. 4 shows, on a larger scale, the contact-maker with a portion of the eccentric band. Fig. 5 is a side view of the same. Fig. 6 shows, on a smaller scale, the entire main-shaft eccentric band. Fig. 7 is an edge view of the band. Fig. 8 is a diagram illustrating the electrical connection. Fig. 9 is a front view of a modification with parts broken away. Fig. 10 is an elevation of the switch detached, as seen from the right in Fig. 9. Figs. 2^A and 2^B are vertical sections of portions on a larger scale in two positions.

Similar letters of reference indicate corresponding parts in all the figures where they appear.

I will describe the counters and indexes as located in the pilot-house and on the bridge, one in each place. (See Fig. 8.) There may be more sets. All are alike and a description of one will suffice for all. The contact-maker is located in the shaft-alley.

An eccentric band B′, Fig. 6, is firmly secured on the main shaft and revolves therewith, having three-fourths inch throw. Gear-teeth are cut on this eccentric band and corresponding teeth on a pinion D^4, carried on a sliding rod D, which is peculiarly mounted and equipped. On its upper end is an insulated conducting-head D′, adapted to form electrical contact between two conductors. The gravity of the sliding parts and the force of a helical spring D^3 serve together to keep the pinion in contact with the band B′. The construction insures that as the shaft revolves a sliding motion is imparted to the rod D, rising and sinking three-fourths inch at each revolution. The rod D is also capable of being inclined in opposite directions. It is guided through a long box E and can rock on a stout pivot E′, bearing in a cast-iron or other firm support A^5, carried on the fixed work of the ship. The engagement of the eccentric band B′ with the pinion D^4 not only induces the endwise-sliding motion in the rod but also develops a lateral force at the lower end, which is in one direction or the opposite, according as the shaft is revolved in one direction or the other.

I provide rolls A^3, turning in bearings A^4, held adjustably on the bulkhead on each side of the sliding rod D near the top. These rolls limit how far the rod D is allowed to incline in either direction. When the engine is running forward, the rod is inclined in the direction shown in Fig. 4, and when it is running astern it is inclined in the opposite direction. The inclination need not be great. I make the direction of such inclination determine which of two counting devices shall be actuated on each of the several distant dials, as the rod D is lifted and lowered with each revolution of the engine.

Two sets of double-pole electromagnets are mounted in a water-tight case A′, of which

one set serves for "ahead" and one set for "astern." Each set of magnets has an armature. I have shown a battery F as a source of electric current therefor.

A spring G^2, insulated on a hard-rubber base on the bulkhead just above the sliding rod D, connects by a wire G′ to a pair of ahead magnets G. Another wire H′, leading to a pair of astern magnets H, is attached to a similar spring H^2, held alongside of G^2, at a little distance therefrom.

O is a return-wire in an intermediate position. This may also be provided with a spring contact-piece, if preferred. It is arranged to contact by its terminal O′ with the head D′ at each rise of the rod D whether it is inclined one way or the other. When the shaft is turning ahead, the rod D reciprocates at such angle that at each rise the head D′ contacts with and forms an electrical connection between the return-wire O and the wire G′, and it follows that the ahead magnets G are intermittently energized and the ahead counting-wheels G^3 in the conning-tower and in the pilot-house, operated by the well-known Geneva stop-motion, will act. When the shaft is turning astern, the connection is made and broken between the return-wire O and the wire H′, leading to the astern magnet H, and the astern counting-wheels H^3 act. In each case only one armature is vibrated and the other, with its train of Geneva mechanism, is idle.

It remains to describe the counters and indexes. Two counters and two indexes at each place, where required, which I have assumed to be the pilot-house and the bridge, are inclosed together in a case A′, with a plate-glass face and a white enameled dial A^2. Above the dial A^2 is a plate A^7, in which are two sufficiently long horizontal apertures *g* and *h*, through which are shown figures carried on the peripheries of Geneva wheels G^3 and H^3, capable of indicating the whole number of revolutions in each direction, respectively. The series of counting-wheels G^3 register the "go-ahead" revolutions. They are worked by the ahead magnets G through an armature-lever G^4, turning on a fixed center A^6. This, by a pawl G^7, gives the required step-by-step revolving motion to the first wheel of the Geneva series G^3. The communication of motion from the first wheel to the succeeding wheels of the series, so as to give a tenth of a revolution to the next wheel at the end of each complete revolution of the first, is the well-known arrangement invented by a young Frenchman (Pascal) some two centuries ago and sufficiently described by the single word "Geneva." This Geneva mechanism is partly shown in Fig. 2. The other set of counting-wheels H^3, which register the "go-astern" revolutions, are worked by the magnets H through corresponding connections. This occurs whenever, by reason of the reversed inclination of the reciprocating rod, the current through the wire G′ is stopped and the current is caused to flow through the wire H′.

On the dial A^2, below the counting-wheels G^3 and H^3, are two conspicuous pointers or indexes P^3 and Q^3, mounted side by side, a little distance apart. On the dial adjacent to each is marked, respectively, the words "Ahead" and "Astern." (See Fig. 1.) They are mounted on separate spindles P^2 and Q^2, capable of turning independently.

The magnets P are energized by a shunt-current received through the wire P′. Whenever a current is sent through the wire G′, which energizes the magnet G and operates the go-ahead counter G^3, a portion is carried through the shunt-wire P′ and also energizes the magnet P and operates the armature P^5. Care must be taken to use wire of proper size and material or otherwise to so graduate the resistance as to insure that neither gets much less than its proper share of the current, so that both the counting and the indexing devices shall be properly operated.

P^6 P^7 are ordinary crank-handles with suitable locking means for turning the respective counting mechanisms into any required position. They are used ordinarily to set the respective mechanisms back to zero.

The armature P^5 operates the spindle P^2 and its index P^3. A score or flat recess *p* is cut in the round spindle P^2 where the armature P^5 bears against it, which score lies sometimes flat against and at other times at an angle of some twenty degrees to the armature. When the armature is attracted toward the magnet, it is drawn against the spindle and turns it until the score is flat against the armature, thus turning the spindle P^2 and the idex P^3 through an angle of twenty degrees and indicating that the direction is ahead and also indicating the rate of the revolutions by the time in which these revolutions follow each other. At a certain period in each revolution the circuit in the electromagnet P is broken, the magnet ceases to attract the armature, and a helical spring P^4, properly adjusted around the spindle, turns the spindle back to its normal position, and the score again lies at twenty degrees to the armature, as shown in Fig. 2^B. The circuit is thus made and broken at each forward revolution of the shaft. A corresponding armature Q^5 is connected to induce an opposite motion in the other index Q^3. This is of no effect during the forward revolutions, which I have termed "ahead revolutions," but immediately asserts itself and indicates when the engine is revolved in the reverse direction. Thus it depends upon the direction of the revolution of the shaft as to which set of magnets is energized, and therefore which index P^3 or Q^3 will thus vibrate.

A wire G^5 connects the magnet Q to a lower contact-strip G^9, bearing against the switch X, which latter is placed at the bottom of the case A′, equipped with a handle or thumb-piece X′. A spiral spring Z exerts a force to bring the switch back to mid-position. Two

contact-strips of metal G^9 G^{10} on each side bear against the hard-rubber ring X. Inserted longitudinally in this hard-rubber ring are two pieces of metal, (not shown,) which make connection between the upper strip G^{10} and the lower strip G^9 on each side when the switch is turned to close the circuits. This switch is in circuit with the common return O of both sets of magnet-wires, as shown in diagram of connections, Fig. 8. When the switch is turned to the right against the force of the spring Z and the circuit closed, the connection is thereby made from lower strip G^9 through a cross-connection to upper left-hand strip G^{10}, and then by a wire to the middle binding-post at top of instrument—the common return. The left-hand wire leads to the left-hand magnets and the connections to common return O are the same as those for the other side.

A five-candle-power lamp W is installed in indicator-case A', which gives illumination to all parts of the dial A^2. This lamp has independent connections, one wire leading directly to base of the lamp W. The other leads first to the switch X and then back to a terminal screw W' on lamp-socket. This is shown by the two crossed wires W^2 W^3 in Fig. 2.

It will be seen that the same contacts of the head D' with the return-contact O' and with one or the other of the springs G^2 or H^2 simultaneously energize the proper magnets and induce the required motions both in the counting devices and in the index devices.

Y is a button at the top operating what I may term a "counting-switch." It controls by the ordinary arrangement of wires, as indicated, the communication of the current from the indicating mechanism up to the counting mechanism. When this switch is adjusted in one position, it causes the ahead counting mechanism to be operated. When it is in the opposite position, it causes the astern counting mechanism to be operated. There is an intermediate position in which it can be set to hold both circuits open, and when thus conditioned the working of the indexes P^3 and Q^3 will continue as before, but neither of the counting mechanisms G^3 or H^3 will act.

Fig. 2^A shows the spindle when the index has been deflected by the pressure of the armature, and Fig. 2^B shows the same when the pressure of the armature is relaxed and the spindle and the index have been returned to their ordinary positions by the constant force of the gentle spring P^4.

I attach importance to the flat portion *p* on the spindle P^2, arranged to be turned by the direct pressure of the armature, for the reasons that it is simple and reliable, is easy to make and adjust, and serves directly without further parts to arrest the motion of the index by the pressure of the armature against the flat portion so soon as the index has been turned to the required extent.

Modifications may be made without departing from the principle or sacrificing the advantages of the invention. I have described the invention as applied with a single shaft. When there are two, there should be two sets of apparatus. Instead of a battery a dynamo may be employed as the source of electric current. It may be preferable to thus work whenever the electric light is to be operated by the same current. Instead of the flat place *p* in the spindle P^2 and a corresponding flat place in the spindle Q^2 there may be a nicely-cut gear-segment on each spindle and a corresponding segment on the end of the armature engaging therewith, so that the changes of position of the armature will induce the same relative changes in the position of the index. Fig. 9 shows such modification.

Parts of the invention may be used without others. The switch X may be dispensed with and the device will be ready to work all the time, a counter and index being always worked whenever the engine is revolved, the choice whether it shall be G^3 P^3 or H^3 Q^3 depending on whether the engine revolves in one direction or the other. The gear-teeth on the periphery of the eccentric band B' and the corresponding teeth on the pinion D^4 may be omitted and the smooth surfaces will serve together successfully. The rod D will rise and sink the same under the influence of such smooth parts and will usually produce the same effects; but I prefer the teeth for the reason, among others, that the slight increase in the friction induced by the engagement and disengagement of the teeth is of advantage in insuring that the inclinations at which the rod D is reciprocated shall be changed with promptness with each reversion of the motion of the engine. The light W may be dispensed with. The proper switch or switches may be set so as to have the circuits complete the main portion of the time, or they can be set so as to have the circuits open under ordinary conditions and only be closed and operate the counter and index for brief periods when required. As there are usually but few astern revolutions, it will in most cases be sufficient to use only one instead of the two counting mechanisms above described. Fig. 9 shows such construction, which may for some uses be preferred. The single counting mechanism in this form of the invention can, if preferred, be allowed to count all the revolutions both forward and backward. For such use the switch Y should be put on and left on all the time. If, on the contrary, it be desired to count only the ahead revolutions, the switch should be turned off when the motion is reversed and again turned on when the revolutions ahead are resumed. Such construction can be used to count also separately both the astern and the ahead revolutions. To effect this only requires a little more attention, as follows: When the engines are reversed, the number of revolutions previously indicated are written down or somehow preserved for reference and the single counter is turned

back to zero. The counter will then proceed to count the astern revolutions, and when after a longer or shorter period the engine is again reversed the number of astern revolutions are noted and the counter is again turned back to zero. Now the ahead revolutions are resumed and the counting of the ahead revolutions proceeds as before, except that it starts again from zero.

I claim as my invention—

1. In a ship telegraphic counter and index, the combination with the main shaft and suitable electrical connections, of an electromagnet P, an armature P^5, a spindle P^2 having a flattened portion *p*, a connected index P^3 and a spring P^4, all arranged for joint operation substantially as herein specified.

2. As an improved instrument having connection with a source of electric current, an eccentric B′ rotating with the main shaft, a rod D reciprocated thereby, and a provision for causing such rod to change its line of reciprocation, in combination with contacts G^2 and H^2 arranged to be affected by each reversion of the motion of the engine, two sets G^3 H^3 of counting devices and two indexes P^3 and Q^3 arranged to distinguish motions ahead and astern, all substantially as herein specified.

3. As an improved instrument having connection with a source F of electric current, an eccentric B′ carried on the main shaft, a rod D reciprocated thereby, a swiveling guide-box E for such rod, a toothed wheel on such rod, and the corresponding teeth formed on such eccentric, in combination with contacts G^2 and H^2 arranged to be brought alternately into effect by each reversion of the inclination, two sets G^3 H^3 of Geneva wheels and two indexes P^3 and Q^3, all arranged both to count and distinguish motions ahead and astern, all substantially as herein specified.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

JOHN M. CORY.

Witnesses:
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PETER J. KERNER.