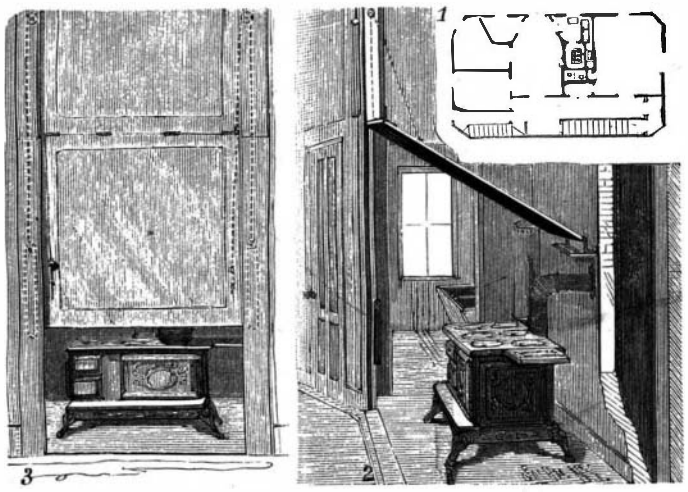
IMPROVED TENEMENT CONSTRUCTION.

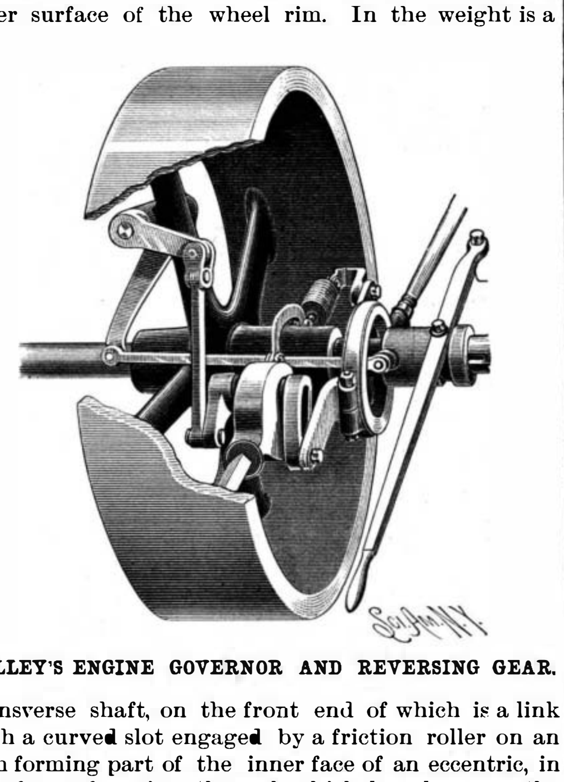
The illustration represents improvements in house construction designed to economize both material and room, and especially affording a novel arrangement of combined dining room and kitchen, for which a patent has been issued to Mr. Samuel Sanderson, of No. 308 Crescent Street, Waltham, Mass. As shown in the small plan view, Fig. 1, a private hall extends nearly the full depth of the house, to which leads a small public hall at the back, the stairways at one side. At the front is a sitting room or parlor connected by a passageway with a combined dining room and kitchen, back of which are two bedrooms, while at one side is a pantry. At one side of the combined dining room and kitchen is a sink room, in which is a double wash tub, with removable partition, to facilitate its use as a bath tub, and adjacent thereto is an alcove room, accommodating a stove or range. The latter room is cut off from the dining room by a partition consisting of a fixed top portion, below which is a movable section or screen formed of two hinged parts, as shown in different positions in Figs. 2 and 3, but normally hanging in alignment. These screens move in vertical guideways, portions of which are cut away to allow the bottom member to swing in, as shown in Fig. 2, when the screen is raised, the swinging section then being engaged by a stop on the mantel. The movable screen or partition is suspended from weighted cords, the weights moving in vertical pockets at each side of the partition. One chimney serves for the front and middle rooms, and adjacent to the chimney is the hot water boiler. At the side of the passageway opposite the stove alcove is a small room for use as a wash room and water closet.



AMERICAN LABORER'S HOME—THE WALTHAM TENEMENT.

A STEAM ENGINE GOVERNOR AND REVERSING GEAR.

According to this improvement, both the governor and the reversing lever fully control a single-pivoted eccentric, carried around at its pivot by the driving shaft, and connected in the usual manner with the engine valve. The invention has been patented by Mr. Harry H. Kelley, of Elyria, Ohio. On the shaft is a wheel having on its inner surface a radial guideway, on which slides a weight connected at its inner end by a slotted link with a spring attached to the opposite inner surface of the wheel rim. In the weight is a transverse shaft, on the front end of which is a link with a curved slot engaged by a friction roller on an arm forming part of the inner face of an eccentric, in the form of a ring, through which loosely passes the main driving shaft. The eccentric is rigidly held on an arm pivoted to a bracket extending from the opposite inner face of the wheel, and the eccentric is connected by the usual straps and rod with the valve of the engine. As the weight slides outwardly with the increased speed of the engine, the link is shifted and the eccentric is moved relatively to the shaft to cause the valve to cut off sooner. Provision is also made to shift the link independently of the movement of the slidable weight by means of the reversing lever shown at the right in the illustration. The rear end of the transverse shaft journaled in the weight carries a crank arm pivotally connected by a link with one arm of a bell-crank lever fulcrumed on one of the spokes of the wheel, and the other arm of this lever is connected by a link with a sleeve sliding on and turning with the shaft, this sleeve being engaged by the reversing lever, whereby the movement of the eccentric may be reversed, and consequently that of the valve controlling the supply of steam to the cylinder. The governor and the reversing lever fully control the eccentric, and at the same time the governor and the lever can independently shift the eccentric to control the valve, the reversing of the engine being effected by moving the eccentric across the shaft.



KELLEY'S ENGINE GOVERNOR AND REVERSING GEAR.

BERSIER'S STEERING COMPASS.

The traditional order, "Don't Talk to the Pilot," that some of our readers have seen posted up on steamers, is upon the point of becoming useless, thanks to a very recent invention of one of our most distinguished naval officers, Lieutenant Bersier. This invention is called the steering compass.

This instrument, in fact, permits of dispensing with the man at the wheel. It is the compass that, in this system, directly actuates the rudder, so as to keep the ship in the proper direction.

Did the use of this new apparatus present no other advantage than the doing away with the pilot, the result, although original and curious, would be relatively of slight importance. But the special merit of this method of steering is the great precision that results from it, thanks to the substitution of the most absolute automatism for the action of the brain of man, which sometimes becomes weary or distracted.

The problem of the automatic steering of ships has often been proposed, since it is an attractive one; but the difficulty in the way of its solution has been the necessity of giving the very delicate and sensitive rose of the new compasses its full liberty, while at the same time utilizing the elementary rotations of the sides of its box with respect to the rose, that is to say, the lurches of the ship, in order to correct such lurches by means of the rudder. In order to govern this part, then, it was impossible to think of utilizing the steering power of the rose; in a word, the latter could not be touched. It is this that explains the want of success of all the tentatives made up to the present to devise warning compasses, that is to say, compasses to signal the deviations of a ship to a distance. In such instruments, a magnetized needle was flanked by two stops forming electric contacts against which it struck, in becoming disturbed, however, in most cases.

As our readers well know, a mariner's compass consists of a glass-covered cylindrical box suspended in gimbals in what is called a binnacle. At the center of the bottom of the box rises a rod that carries an iridium pivot. A light paper disk slit upon an aluminum circle carries eight parallel magnetized needles. Such is the card or rose, which weighs 375 grains, at the most, in the large models. Its circumference is graduated in degrees from 0 to 90 in each quadrant, starting from the north and west points, on the one hand, up to the east and west points on the other. At its center there is a sapphire which rests upon the point of the pivot. The position of the needles below the disk, to which they are attached by silk threads, assures the horizontality of the rose. The feeble magnetic momentum that so light a rose may have prevents, as may be seen, any stress being exerted upon it under the penalty of disturbing it completely.

Lieutenant Bersier, as long ago as the year 1888, thought of employing the electric spark of the Ruhmkorff coil to unite a point of the circumference of the rose and two semicircular plates insulated electrically from each other and the sides of the box that they covered. Some studies successively carried on upon a torpedo boat and a large cruiser were arrested at this epoch by the absence of electric wiring upon many ships. The operation of the coil, in fact, can be practically assured only by a small derivation from a dynamo to the exclusion of electric batteries. Things are now much changed. Upon all modern ships, a few amperes are as easily taken from a general circuit conductor as water is from a cock. So the steering compass will be henceforth easy to install. It operates as follows: In a room located at a few yards distance from the best compass on board is placed a Ruhmkorff coil supplied by a mean current of from 2 to 3 amperes. The induced current of this coil, through a flexible wire, reaches the pivot of the compass, whence it jumps to the aluminum capsule that carries the sapphire, and follows an aluminum wire, forming a radius of the north pole of the rose (Fig. 1).

According as the ship is to the right or left of its course, the current leaps in a spark of about an inch from the north point to the right hand or left hand plate of the box and flows, at a few yards therefrom, into one or the other of two electro-magnets, which close the circuit of a small 150 watts motor, in order to cause it to revolve to the left or to the right. The shaft of this motor is keyed upon that of the rudder motor. One merely replaces here the muscular strength of the pilot without in anywise changing the already existing parts of the ship. This installation is therefore simple and inexpensive (Fig. 3). The box of this compass has been under trial for two months in a squadron and the experiments have proved a perfect success.

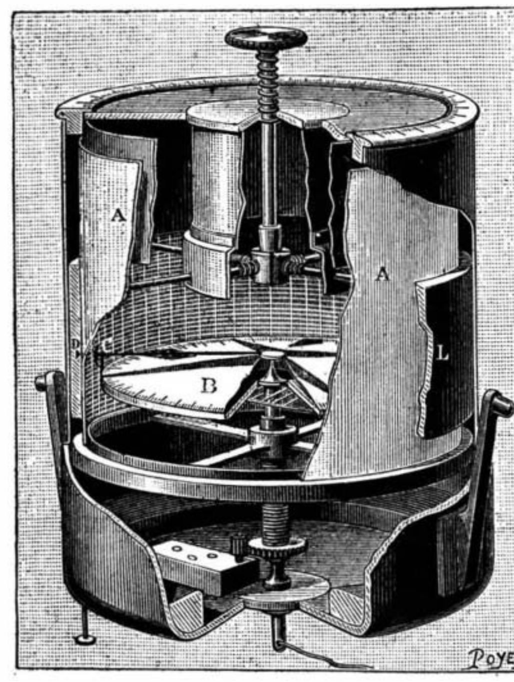


Fig. 1.—GENERAL VIEW OF THE STEERING COMPASS.

AA, band of paper upon which the variations in the route of the ship are inscribed; B, rose; C, bridge of fibrine placed at the north point of the rose; D, circle of metal divided into segments corresponding to a signal; L, cylindrical ebonite guide of the band of paper.

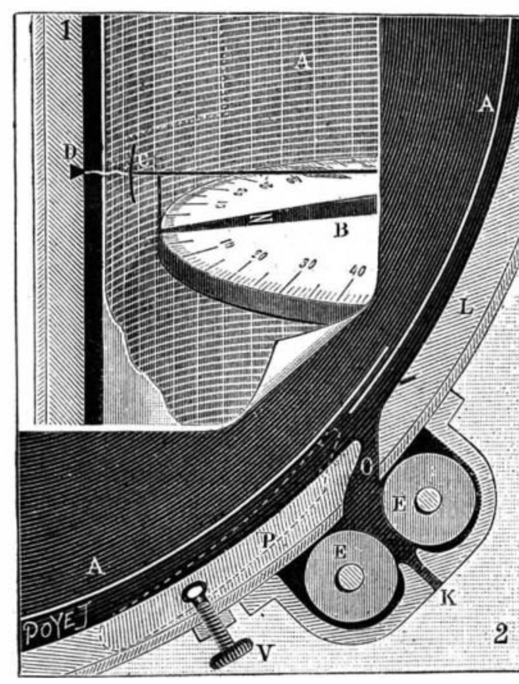


Fig. 2.—EXPLANATORY DETAILS.

A, band of paper; B, rose; C, fibrine bridge; D, circle of metallic pieces set into ebonite and each corresponding to a signal; L, paper guide; O, slit for the introduction of the paper; EE, rubber rollers for the introduction of the band of paper; V, regulating screw.

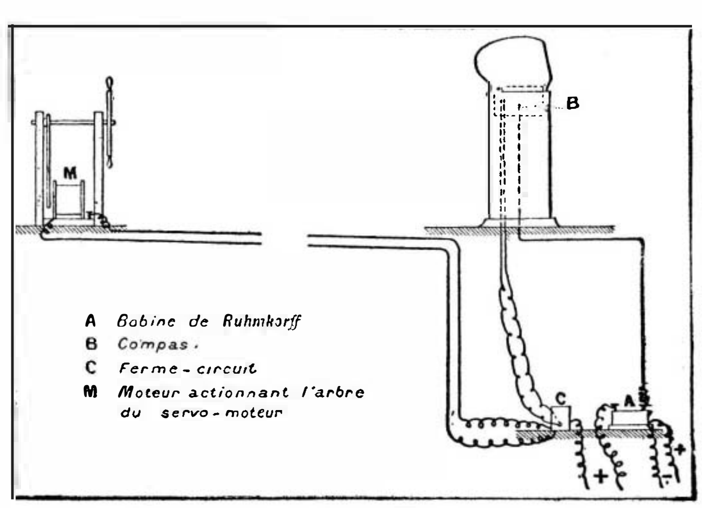


Fig. 3.—DIAGRAM EXPLANATORY OF THE INSTALLATION OF THE REGISTERING COMPASS ON SHIPBOARD.

The absolute indifference of the rose to the electric spark was particularly exhibited, and it was found possible, as the report of the trials proves, to steer within a fraction of a degree or thereabout. Such indifference of the rose evidently results, in the first place, from the fact that the induced current employed has an intimate intensity—it is alternating. Moreover, certain precautions are taken as regards the leaping of the spark. The coil and the electros are at a distance from the compass. Experience shows that it is sufficient for them to be at a distance of five yards therefrom in order to obtain the best result. Thus the induced circuit of high tension, and consequently of relatively difficult insulation, is not ten yards in length. The number of the coil is so selected as to prevent all accidental losses.

Lieutenant Bersier has patented this new instrument under the name of registering governor. When the apparatus acts as a register, the box is higher and its sides are covered with a band of paper which receives from a clockwork mechanism an ascensional movement of 3 inches in four hours, a length of time that constitutes the duration of one point (Fig. 2). The electric spark pierces this paper in its travel from the north point of the rose to the plates. The result is that every lurch of the vessel, however short be the duration of it, is registered. Thus responsibility can be clearly established in the case of a running foul of another vessel.

Finally, the box of the steering compass, provided with six plates, for example, instead of two, each being connected with a distinct Geissler tube placed in front of the man at the wheel, serves, under the name of automatic transmitter of course orders, to steer by hand from any point whatever of the ship with a compass placed no matter where. It is this instrument that has been tried in a squadron, and two new specimens of which are now in course of construction for our navy by Mr. Postel-Vanay. The solution of this problem was very necessary, since, upon our new ships, the binnacle compass, always placed too near masses of iron, possesses no sensitiveness, but "sleeps," according to the technical expression. A method of steering with the standard compass placed under the best conditions possible became necessary, and it became necessary, too, to find a means of sending its indications to a distance. Experience has proved that six or eight of these indications are more than adequate to permit of effecting all the changes of route and of steering with a precision hitherto unknown. Only a mariner can appreciate this point, which is important because of the great simplification that proceeds from it. As long ago as 1888, Lieutenant Bersier steered with four signals only, which, through the rapidity with which they succeeded each other, gave an accurate idea of the velocity of rotation of the ship. The manner of effecting the changes of route with this instrument is, in truth, interesting. A simple revolution of the cover of the compass by hand, carrying along the plates with it, is immediately followed by an identical rotation of the ship.

The edge of this cover, moreover, is graduated like the rose itself, and, in order to hold any route whatever, North 25-East, for example, it suffices to place in the axis of the vessel, opposite an appropriate index, the division 25, comprised between the North and East of the cover. The pilot then takes the new route without even being aware of the fact, in thinking that he is correcting a lurch. The straight route or zero indication can be transmitted to him only when there is an absolute superposition of the graduation of the cover and of that of the rose. The spark then leaps both to the first plate to the right and the first to the left. The slightest lurch has the effect of making it leap to only one of them.

The entire precision of the apparatus that we have just described rests upon the sensitiveness of this zero signal.

Upon the whole, the following are the advantages that large steamers, for example, must derive from the use of these new apparatus, which, moreover, can make but one, since the box and the coil are always single: great precision, and consequently, security and economy in navigation. At present, steering is done within about one or two degrees, that is to say, with a lateral deviation of twelve miles for a day of 480. With the apparatus under consideration, the lateral deviation would be annulled, as the steering is done within a fraction of a degree. Finally, the steering would be done with the best compass on board, and this in many cases, in which the common compass is defective, would present a great advantage. All this is of value, especially in foggy localities, where astronomical observations cannot be taken. To such advantages must be added that which gives a better estimate of the route obtained by the registering.—*La Nature.*

What the Strikers Have Learned.

We are in the habit of saying that, in a government such as ours, the people must be educated, and of supposing that the necessary education is to be had in schools. But experience keeps the only school that most people learn practical wisdom in, and it is by forming trade unions and trying what they can accomplish that workmen learn the nature of law, the powers of government, and the fundamental principles of political economy. They have now learned that such a strike as that of the American Railway Union must necessarily fail. They have learned that when the police and the militia fail to preserve order, the United States forces can be called in. They have found that while the great body of the people have kind hearts and are glad of the prosperity of laboring men, they do not sympathize in any attempts to promote this prosperity by interrupting all industry and destroying property. The cost of this education has been considerable, but it seems probable that the lesson would have had to be learned, sooner or later, and upon the whole the present time was the best that could have been selected. The rights of action possessed by associations of workmen having received this practical definition, are not likely to be immediately exceeded again; and we may well remember, therefore, that laws tending to limit the freedom of workmen to form such unions as they choose, and to utter their complaints and aspirations, are questionable.—*D. McG. Means, in the Forum.*

Effects of Imperfectly Balanced Locomotives.

For the past ten years, and possibly longer, there have been practical evidences, upon certain railroad lines upon which speeds of 70 miles an hour and over are attained, that imperfectly balanced engines are great track destroyers, and that in extreme cases they make a permanent bend in the rails. These bends are peculiar, and differ entirely from any bend or deflection that could possibly occur by any other force exerted by a locomotive. They are *downward* and *inward.* The bent rail in the track shows a downward bend of a half-inch or slightly more, and an inward bend from one-eighth to one-half inch. When these rails are removed from the track, the permanent bend, both horizontally and vertically, is from six to eighteen inches, measured on an ordinate of the chord between the ends of the rail. These bends have been found at regular intervals equal to the circumference of the driving wheels that made them, and for distances varying from one-quarter of a mile to a mile or more.

In a number of instances, the upward throw of the counterbalances was so great as to throw the drivers alternately clear of the rails, and in descending the wheels did not resume their proper position on the rails, but instead the flanges descended on the tops of the heads of the rails, sometimes as far from the gauge lines as the centers of the heads. An examination of the driver tires showed that the flanges of the rear drivers alone had been riding the tops of the rails, and the marks on the flanges were all directly under the counterbalances.

On one road the number of bent rails removed from the track was very great, and they had to be sent to the rail mill by the car load to be straightened by machinery, as the ordinary rail benders used by the section men could not do the work. The introduction of much heavier rails and more care in counterbalancing for high speeds reduced the number of bent rails, but the bent rails now in the same line of road show that heavy rails, within reasonable limits, will not prevent their being bent in service, neither can it be assumed that the rigidity of the track will prevent the development of the forces that do the damage.

The bends referred to are distinguished, as before stated, by being downward and inward. The inside spikes, for a distance of about four ties, are moved inward, while the rail has left the corresponding spikes on the opposite side of the rail. The downward bends are best observed by glancing over the surface of the rail. The bends are peculiarly short, both vertically and horizontally.

While these remarks apply particularly to one road as far as they apply to specific details, they apply generally to all roads where extraordinary speeds are attained, and it is believed that a person who can recognize a rail that has been bent by an improperly balanced locomotive can find them in any track where speeds of over 70 miles per hour are reached. The danger of running improperly balanced engines at high speeds is obvious, no matter how perfect the track and bridges. Again, the wear and tear upon a locomotive is extraordinary in broken frames, broken springs, spring hangers, driving wheel centers, etc.

The locomotives known to produce the effects as stated are generally described as express passenger engines four wheel connected, 36 and 44 tons, four wheel truck, 68 inch drivers and running speeds reaching 80 miles an hour at times. It is not intended to intimate that no damage to track is done unless rails are permanently bent. On the contrary, the same forces which, when developed to their maximum, bend rails, are developed to a certain extent at all high speeds, and when those speeds are not high enough to make the forces great enough to actually make permanent bends in the rails, they are sufficient to knock the track out of line and surface, and thereby greatly increase the cost of maintenance of way.

Locomotive engineers have been known to report bad places in the track, when actually the jumping of their engines was the only cause for the apparent bad riding of the track. With the increased demand for high speeds, locomotives will have to be designed that are perfectly balanced. The limit of safe speed with unbalanced engines has been reached and passed. As a matter of economy in track and motive power repairs alone, the perfectly balanced locomotive is a necessity upon high speed lines.—*Headlight, in The Railroad Gazette.*

The Great Siberian Railway.

The Siberian Railway, one of the greatest enterprises of the century, must attract attention by reason of the important commercial, political and strategic objects it is designed to serve. In length it will exceed by more than one-fifth the length of our transcontinental lines from New York to San Francisco. Besides connecting Vladivostok, its eastern terminus on the Pacific, with Moscow, distant 9,500 miles, it will reach ports on the Black Sea, the Caspian and the Baltic. At present the English for the most part carry on the commerce of China, Japan and India with Europe, but the new railway will, it is hoped, largely alter the route of this commerce and make the Russians its beneficiaries. In twelve or thirteen days it will carry goods from the Baltic to Vladivostok, as against the six or eight weeks now required. The tea and silks of China would go west via the Siberian Railway rather than by way of the Suez Canal or around the Cape. The railway will, moreover, vitalize the resources of vast regions now torpid for want of communications. The empire is wanting in arteries of commerce. It has but 29,000 miles of railroad. Its navigable streams are numerous, but by reason of extremes of heat and cold they are navigable, as a rule, only in the spring and autumn. The Black Sea may be blocked by Turkey or England. The rivers of Siberia emptying into the Arctic Ocean are practically of no value for transportation except in their upper courses and for part of the year. The isolation of vast areas of Siberia practically destroys their great value for purposes of agriculture and mining. With better means of communication population would in Russia flow east, just as in the United States the construction of our transcontinental lines caused it to flow west. The natural resources are there; accessibility will bring them speedy development. Already the annual product of gold and silver in Siberia is very large, though its production is made expensive from want of modern means of transportation, but with the building of the Siberian Railway the product will probably be much increased. The wealth of the region to be traversed in iron, coal, salt and precious stones is well known.—*Baltimore Sun.*

A Trolley Without Poles.

Chemnitz, Saxony, has banished horses from her street cars and substituted the trolley. In a report to the State Department on the subject Consul J. C. Monoghan says one of the principal novelties of the adopted system is that no poles are used. The method of stringing wires is by means of ornamental rosettes fastened into the woodwork or walls of houses, having projecting hooks to which the wires are attached. These hooks are firmly fastened and are tested with seven times the weight they will be called upon to bear. Owners of houses without exception preferred to allow the use of their houses free rather than have posts on the sidewalk. The streets through which the cars wind their way are wider than Washington Street, Boston, or Westminster Street, Providence. The system has now been in operation for six or eight months, and has proved satisfactory and successful. The railway tracks, in conformity to the law, are level with the pavement, and accidents to vehicles of all kinds are rare. The gauge is narrower than in America, but the cars keep the track and run as rapidly and smoothly as in the United States. In the heart of the city they run 220 yards per minute and in the suburbs 330 yards per minute.

The increase of traffic since the introduction of electricity has been 60 per cent notwithstanding the strenuous opposition to the change and the year of exceedingly hard times. The cars have no conductors. The motorman is the only person on board who represents the company. By doing away with conductors the company saves 44,000 marks annually. The fare is only 10 pfennigs, or trifle less than 2½ cents, on all routes, including transfers. Should 150,000 persons evade payment in twelve months, the loss would be only 15,000 marks. It would take 450,000 evasions in fare to offset the company's savings by dispensing with conductors' salaries. Among a people who pay for food and drink in restaurants, saloons and gardens on their honor alone, it is unlikely that the company loses much. Culprits in this regard when detected are punished by having their names advertised in the newspapers as a warning to others. Fare boxes are attached to both ends of the car; so there is no such excuse offered as "difficulty in getting forward."