J. ROCHE.

AEROPLANE.

APPLICATION FILED JUNE 1, 1911.

1,083,464.

Patented Jan. 6, 1914.

3 SHEETS—SHEET 1.

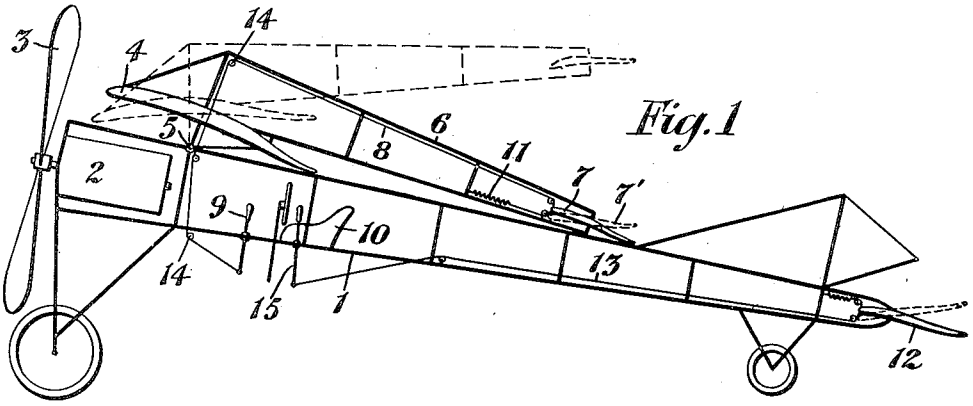


Fig. 1

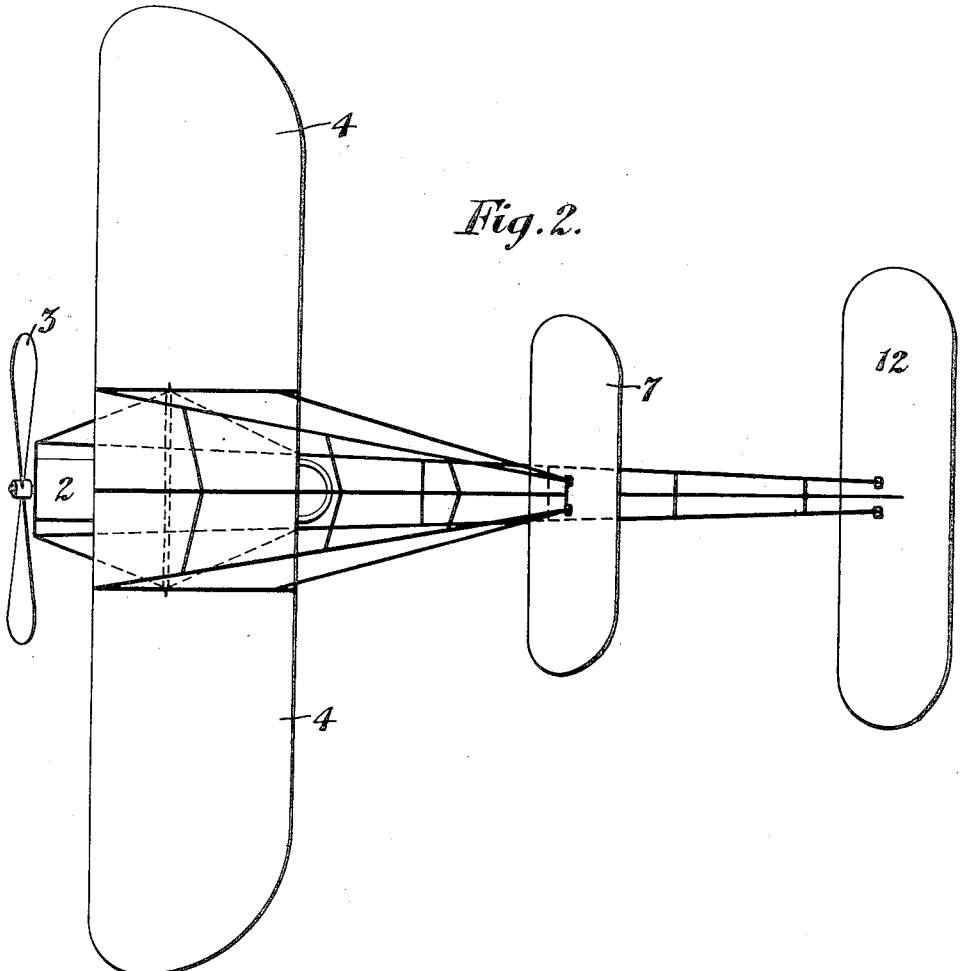


Fig. 2.

Witnesses:

H. H. Wright

A. Alfred Jaudé

Inventor

Jean Roche

By his Attorneys

Wright Brothers

J. ROCHE.

AEROPLANE.

APPLICATION FILED JUNE 1, 1911.

1,083,464.

Patented Jan. 6, 1914.

3 SHEETS—SHEET 2.

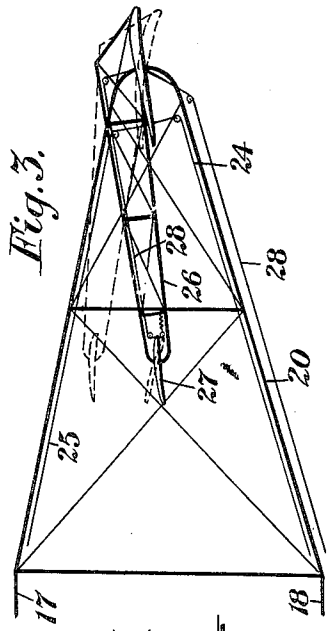


Fig. 3.

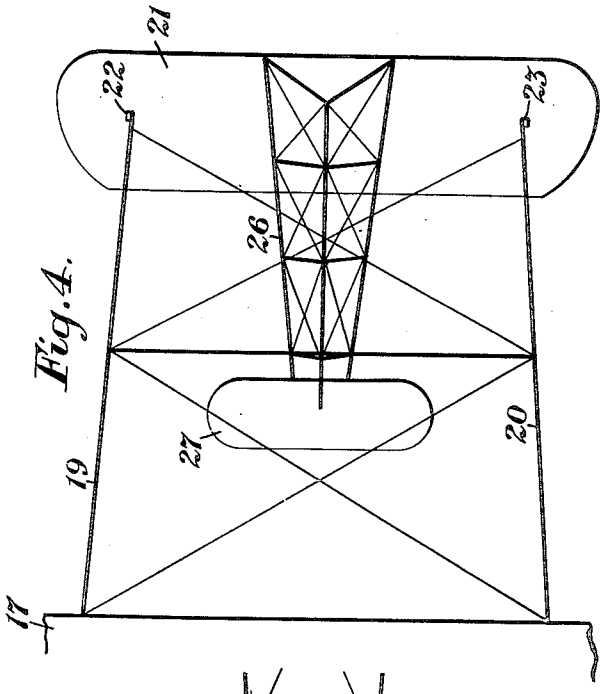


Fig. 4.

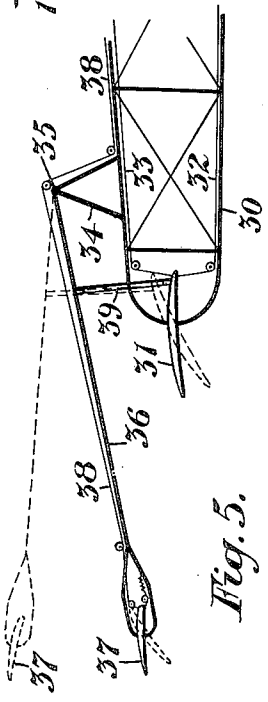


Fig. 5.

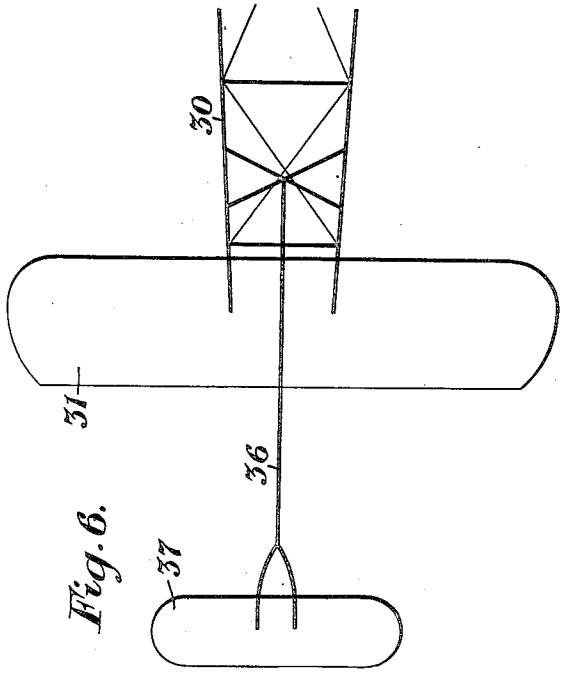


Fig. 6.

Witnesses:
H. H. Knight
H. Albert Jaenke

Inventor
Jean Roche
By his Attorneys
Knight Bros

J. ROCHE.

AEROPLANE.

APPLICATION FILED JUNE 1, 1911.

1,083,464.

Patented Jan. 6, 1914.

3 SHEETS—SHEET 3.

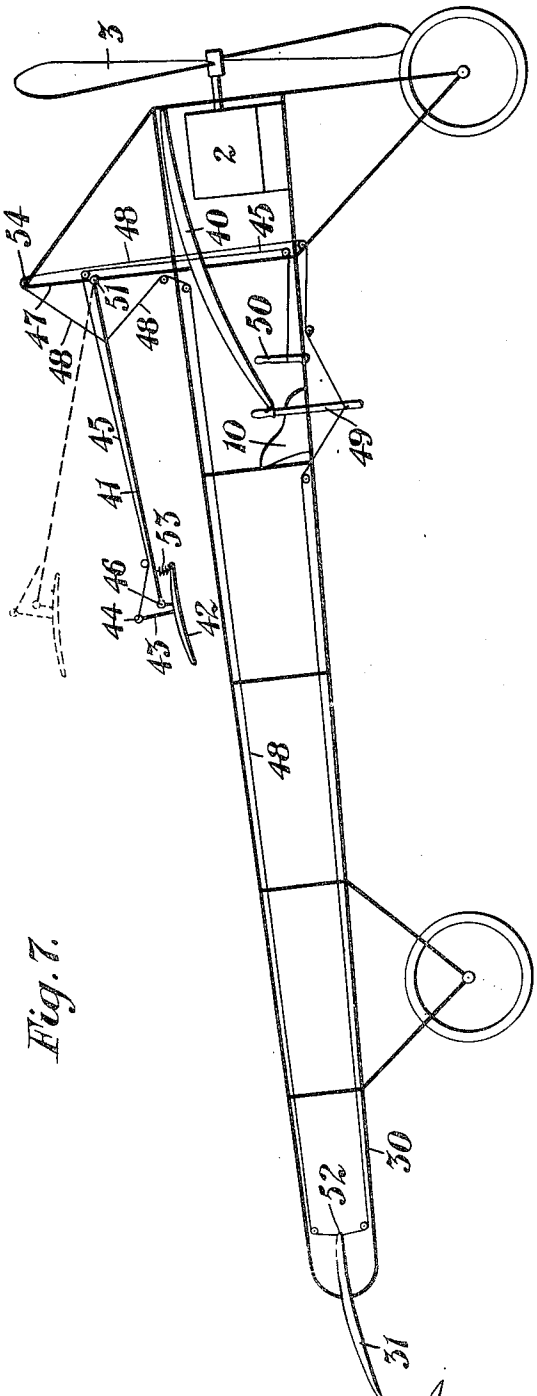


Fig. 7.

Witnesses:

H. A. Goepel

H. Alfred Hauke

Inventor

Jean Roche

By his Attorneys

Dewey & Co

UNITED STATES PATENT OFFICE.

JEAN ROCHE, OF NEW YORK, N. Y.

AEROPLANE.

1,083,464. Specification of Letters Patent. Patented Jan. 6, 1914.

Application filed June 1, 1911. Serial No. 630,621.

To all whom it may concern:

Be it known that I, JEAN ROCHE, a citizen of the Republic of France, and resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Aeroplanes, of which the following is a full and clear specification illustrated in the accompanying drawings, the particular novel features being more fully pointed out in the annexed claims.

My invention relates to a device for aeroplanes or the like, by means of which the balance of the machine with regard to the direction of travel, is automatically maintained; that is to say, if the operator for instance adjusts his elevating planes or his main plane, if such main planes have means for elevating and descending, to travel at a certain height or to descend or ascend, my novel device will take care automatically that the machine is maintained at the desired angle and it will prevent it from inadvertently tilting up or down against the will of the operator through adverse air currents or the like.

In the accompanying drawings I have shown several forms in which my invention may be reduced to practice.

In these drawings Figure 1 represents diagrammatically a side elevation of a monoplane, provided with my automatic balancing device. Fig. 2 represents a plan view thereof. Fig. 3 represents a diagrammatical side elevation of the front portion of a biplane provided with my novel balancing device. Fig. 4 represents a plan view thereof. Fig. 5 represents a diagrammatical side view of the tail end of a bi-plane provided with my automatic balancing device. Fig. 6 represents a plan view thereof, and Fig. 7 represents a modification of the form shown in Figs. 5 and 6 seen in side elevation.

In Fig. 1, 1 is the main truss frame of the monoplane with the motor mounted in the square marked 2.

3 is the propeller driven by the motor.

Instead of mounting the main planes as has been done heretofore fixed to the frame 1, I attach these main planes 4 pivotally to the frame of the machine, the pivot point being located at the point marked 5 in Fig. 1, which is substantially in line with the vertical through the center of gravity of the frame when the operator is in his seat, though the pivot point may be slightly ahead of, or in the rear of this line, according to the construction of the machine. To these main planes is fixed a small tail frame 6, the rear end of which carries a rudder 7 which may be tilted on a horizontal axis which runs transversely to frame 6. This rudder may be operated in the manner well known in flying machines by a cable 8 which is led over pulleys 14 closely past pivot point 5 onto the main frame 1, where a lever 9 is provided near the operator's seat 10, so that by operating this lever 9, the rudder 7 may be tilted for instance into the position shown in dotted lines in Fig. 1 at 7'. By thus closely leading the cable 8 past the pivot point 5 the tilting of the tail and planes on their pivot will not change the adjustment of the cable. The rudder may be held in normal position by means of spring 11. The tail of the main frame 1 is provided in the usual manner with a rudder 12 controlled from the operator's seat through cable 13 and lever 15. When the machine is in the air the main frame 1 has approximately the position shown in the drawings; that is to say slightly inclined toward the rear and the auxiliary tail 6 has a position approximately intermediate that shown in full lines and that shown in dotted lines.

From Fig. 2 it will be noted that the auxiliary rudder 7 of tail 6 is not only smaller in the direction longitudinally of the machine but it is also smaller transversely of the machine and the area of this auxiliary rudder relatively to the area of the main plane 4 is chosen so, and the angle to which it is tilted relatively to the angle at which main plane 4 is set in the auxiliary tail 6 is such, that this auxiliary tail when the machine is in operation will maintain a position intermediate the one shown in full and in dotted lines as previously stated. The tail end of the main frame 1 is balanced as previously stated in the ordinary manner by horizontal rudder 12 so that in the flight this frame will substantially maintain the position shown in the drawings. The effect which is obtained by the auxiliary tail which by its movement controls the angle at which the main plane is presented to the wind, is such that if for instance a gust of wind should come from above from the front or from the rear, which in machines which have their main planes rigidly attached to the frame has the effect of depressing the forward end

of the machine, it will in this particular machine also tilt the rear end of auxiliary tail 6 down for instance in the position shown in full lines in Fig. 1. This raises the front edge of the main plane toward the direction of travel and presents this plane thereby under a more effective angle and immediately raises the machine again, without any action by the operator. On the other hand, if for instance a gust of wind should come from below, which tends to raise the machine in the front against the will of the operator, the auxiliary tail is raised for instance into the position shown in dotted lines in Fig. 1, and automatically tilts the front edge of the main plane down and thus the machine tends to descend again without any action of the operator. Rudder 7 of the auxiliary tail 6 being once set by the operator for the forward flight under normal conditions, so that through its normal relation it will just counterbalance the elevating effect of the main plane, it need not be touched again in case unforeseen currents strike the machine.

I have shown this particular application of an auxiliary tail and auxiliary rudder attached to the main plane of a monoplane, but it is of course obvious without necessitating an illustration, that instead of one main plane any suitable number of main planes may be provided, one above the other, to which the auxiliary rudder 7 may be tilted in such manner that it will just counterbalance the lifting effect of these planes, so that they will permit straight forward flight. Such modified forms in no way change the general construction shown, as well of the tail as of the main frame of the machine.

In Figs. 3 and 4 I have illustrated how my auxiliary device may be applied to the so-called lifting or front planes of a bi-plane. These figures represent the frame construction of the front end of a bi-plane in more or less diagrammatical form, the main planes of the bi-plane being partially shown at 17 and 18, in Fig. 3. Between the front ends of the lateral truss frames 19 and 20 the lifting plane 21 is pivotally attached at 22 and 23 in the ordinary manner and it may be also controlled in the usual manner by hand by means of cables 24 and 25, only a portion of which is shown. To this elevating plane 21 the auxiliary tail 26 is attached, the rear end of which carries auxiliary rudder 27 which may be tilted on a horizontal axis transversely to the tail 26 by means of cable 28 which, similarly to the manner shown in Fig. 1 is led past the pivotal axis of lifting plane 21 to the operator's seat (not shown in Fig. 3). Again, similarly to the manner shown in Fig. 1, in which the area of the auxiliary plane is dimensioned relatively to the area of the main plane which it is to control so that a perfect equilibrium may be obtained, in the modification in Figs. 3 and 4, the auxiliary plane 27 is dimensioned in size relatively to the lifting plane 21, so that when the auxiliary plane is set at an angle to plane 21, the elevating plane will assume a certain angle to the direction of flight so that under normal conditions the machine will fly straight forward. If now an air current should strike the machine inadvertently from above which tends to throw the head of the machine downward, the auxiliary tail plane 27 being struck by the same current and being far away from the pivotal axis of its main plane, will tilt the rear end of the auxiliary tail 26 downward and thus turn the front edge of the lifting planes up, so that thereby the head of the machine is raised again without the action of the operator. The reverse action takes place when an air current strikes the front of the machine from below. By means of cable 28 the operator is of course enabled to control the angular position of the auxiliary plane 27 to the elevating plane 21 during the flight at any time he wishes, so that by thus depressing or raising the rear end of tail 26 for any length of time, the elevating plane 21 is depressed or raised thereby, so that he may ascend or descend at any angle desired in similar manner in which heretofore the operator was enabled to ascend or descend by tilting his elevating planes upward or downward.

A further modification of the manner in which my improvement may be applied to an aeroplane, is illustrated in Figs. 5 and 6. In these figures, 30 represents the frame portion of the rear end of an aeroplane, either monoplane or multiple-plane. 31 is the horizontal rudder pivoted as usual in machines of this kind and controlled by means of cables 32 and 33, the hand operation of which is not shown here, as this is commonly known in the art. To the upper side of frame 30 any suitable distance from its rear end is mounted a pivot support 34 to the upper end 35 of which is pivotally attached auxiliary tail 36 which carries at its rear end, horizontally pivotally attached to it, auxiliary plane 37, the area of which is suitably dimensioned relatively to the area of plane 31. This auxiliary plane 37 may be tilted and held at any suitable angle by means of cable 38 which is led forward to the operator's seat (not shown) where it may be hand controlled in any manner well known in the art. The front edge of the rudder plane 31 is linked to auxiliary tail 36 by means of link 39 a suitable distance from the pivot point of tail 36 as shown. The effect of this arrangement is similar to the effect of the arrangement shown in the modifications described heretofore. When the angle at which auxiliary plane 37 is set is such that the auxiliary tail 36 will assume in the straight forward flight the po-

sition for instance intermediate the ones shown in full lines and in dotted lines in Fig. 5, and if now through some cause the main plane of the machine (not shown) should be tilted downward against the will of the operator, auxiliary tail 36 will be thrown into the position shown in full lines, whereby the main rudder 31 is tilted into the position shown in full lines in Fig. 5, which has the effect of depressing the main tail 30 of the machine, so that the machine now has a tendency to rise. If, on the other hand, for instance an air current from below should tend to raise the front of the machine, auxiliary tail 36 is thereby thrown into the position shown in dotted lines in Fig. 5, whereby the main rudder 31 is thrown into the position shown in dotted lines in Fig. 5. This has the effect of raising the main tail 30 so that now the machine has a tendency to ascend. Also in this case the action of the auxiliary tail 36 is entirely automatic so that the machine is righted again relatively to the forward flight of the angle desired. By properly setting the angle of auxiliary tail plane 37 relatively to the desired line of travel, the machine may permanently travel any desired angle upward or downward irrespective of temporary changes of direction of travel caused by adverse air currents.

The control of the main rudder as shown at 31 in Figs. 5 and 6 by the auxiliary tail 36, may be also obtained with the same effect and in similar manner if this auxiliary tail is not pivoted at or close to the end of tail 30 of the machine but at any suitable place intermediate the two ends of the machine. This is shown for example in Fig. 7, where the main elements of a monoplane are represented in a manner similar to that shown in Figs. 1 and 2. The structure shown in Fig. 7, however, is different in one principal feature which consists in having the main plane 40 fixed in the machine frame, contrary to the main plane 4 in Figs. 1 and 2 which is pivotally connected with the machine frame as described. Referring to Fig. 7, near the front end of the machine a stanchion 47 rises above the frame structure and to this stanchion auxiliary tail 41 is pivoted at 51 and this tail carries at its rear end auxiliary plane 42 which is pivotally attached to it at 46. A spring 53 attached to the forward edge of plane 42 and to the auxiliary tail, tends to hold this plane in a normal position relatively to the tail structure. From auxiliary plane 41 rises a rod or an equivalent structure 43 to the outer end 44 of which is attached a cable 45 which runs over rolls along the tail 41, over the latter's pivot point 51 down stanchion 47 and to a lever 50 near the operator's seat 10, so that by operating this lever 50 the auxiliary plane 42 may be set at any angle relatively to its tail structure in like manner as shown and described with reference to the previous figures. At a distance from pivot point 51 an endless cable 48 is connected to tail 41, one part of which runs over a roll 54 at the upper end of stanchion 47 and down the stanchion and along the lower main frame of the machine where it is fixed to a lever 49 pivoted in the main frame of the machine, thence back to the main tail of the machine where it is attached to the front edge of main rudder 31, thence forward again to stanchion 47 and back to tail 41. If thus by inadvertent rising of the machine the auxiliary tail is for instance raised into the position shown in dotted lines in Fig. 7, this movement of the tail has the effect of raising the front edge of rudder 31 which in turn raises the tail of the machine and thus re-establishes the desired equilibrium in similar manner as described with reference to Figs. 5 and 6. The reverse action takes place if the main plane inadvertently tilts downward. Simultaneously, if desired the operator has control over the movement of the main rudder 31, by operating the lever 49 which is located adjacent to the seat 10. It is of course understood that also the distance from the tail point at which the auxiliary plane 7 in Fig. 1, 27 in Fig. 3, and 37 in Fig. 5, is attached to its support, is of considerable importance as to the action and effect of the tail and this distance must be suitably proportioned to the size of the auxiliary plane and to the plane which it is to control.

What I claim is:

1. In a flying machine of the character described, having a controlling plane for maintaining the balance of the machine in the desired direction of travel, said plane being pivotally attached to the main frame of the machine, and having an auxiliary tail connected to it and provided with an auxiliary plane at its rear end adjustable at an angle to said controlling plane to automatically maintain said controlling plane at the desired angle to the desired direction of travel.

2. In a flying machine of the character described, having a controlling plane for maintaining the balance of the machine in the desired direction of travel, said plane being pivotally attached to the main frame of the machine and having an auxiliary tail connected to it and provided with an auxiliary plane at its rear end, adjustable at any angle to said controlling plane and having an area suitably proportioned relatively thereto to automatically maintain said controlling plane at the desired angle to the desired direction of travel and to automatically restore said desired angle when said controlling plane has been deflected against the will of the operator.

3. In a flying machine of the character described having at least one main supporting plane running transversely to the main frame of the machine and pivotally attached thereto on a transverse horizontal pivotal axis, said plane having an auxiliary tail fixed to it, which carries an auxiliary plane at its rear end disposed at a distance from said main plane and adapted to be set at any suitable angle to said main plane, whereby said auxiliary plane tends to automatically maintain said main plane at the desired angle to the desired direction of travel, whereby said auxiliary plane automatically restores the desired angle of said main plane when the main plane has been deflected against the will of the operator.

JEAN ROCHE.

Witnesses:
H. ALFRED JANKE,
M. G. CRAWFORD.