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for the Purpose of Fixing a Prime Meridian and a Universal Day. October, 1884., by Various

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INTERNATIONAL CONFERENCE

HELD AT WASHINGTON

FOR THE PURPOSE OF FIXING

A PRIME MERIDIAN

AND

A UNIVERSAL DAY.

OCTOBER, 1884.

WASHINGTON, D. C.
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1884.

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International Meridian Conference

[Pg 1]

HELD IN THE

CITY OF WASHINGTON.

I.

SESSION OF OCTOBER 1, 1884.

The Delegates to the International Meridian Conference, who assembled in Washington upon invitation addressed by the Government of the United States to all nations holding diplomatic relations with it, "for the purpose of fixing upon a meridian proper to be employed as a common

zero of longitude and standard of time-reckoning throughout the globe," held their first conference to-day, October 1, 1884, in the Diplomatic Hall of the Department of State.

The following delegates were present:

On behalf of Austria-Hungary—

Baron IGNATZ VON SCHÆFFER,
Envoy Extraordinary and Minister Plenipotentiary.

On behalf of Brazil—

Dr. LUIZ CRULS,
Director of the Imperial Observatory of Rio Janeiro.

On behalf of Colombia—

Commodore S. R. FRANKLIN, *U. S. Navy,*
Superintendent U. S. Naval Observatory.

On behalf of Costa Rica—

Mr. JUAN FRANCISCO ECHEVERRIA,
Civil Engineer.

On behalf of France—

Mr. A. LEFAIVRE,
Minister Plenipotentiary and Consul-General.
Mr. JANSSEN, *of the Institute,*
Director of the Physical Observatory of Paris.

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On behalf of Germany—

Baron H. VON ALVENSLEBEN,
Envoy Extraordinary and Minister Plenipotentiary.

On behalf of Great Britain—

Captain Sir F. J. O. EVANS,
Royal Navy.
Prof. J. C. ADAMS,
Director of the Cambridge Observatory.
Lieut.-General STRACHEY,
Member of the Council of India.
Mr. SANDFORD FLEMING,
Representing the Dominion of Canada.

On behalf of Guatemala—

M. MILES ROCK,
President of the Boundary Commission.

On behalf of Hawaii—

Hon. W. D. ALEXANDER,
Surveyor-General.
Hon. LUTHER AHOLO,

On behalf of Italy—

Count ALBERT DE FORESTA,
First Secretary of Legation.

On behalf of Japan—

Professor KIKUCHI,
Dean of the Scientific Dep't of the University of Tokio.

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On behalf of Mexico—

Mr. LEANDRO FERNANDEZ,
Civil Engineer.
Mr. ANGEL ANGUIANO,
Director of the National Observatory of Mexico.

On behalf of Paraguay—

Captain JOHN STEWART,
Consul-General.

On behalf of Russia—

Mr. C. DE STRUVE,
Envoy Extraordinary and Minister Plenipotentiary.
Major-General STEBNITZKI,
Imperial Russian Staff.
Mr. J. DE KOLOGRIVOFF,
Conseiller d'État actuel.

On behalf of San Domingo—

Mr. M. DE J. GALVAN,
Envoy Extraordinary and Minister Plenipotentiary.

On behalf of Salvador—

Mr. ANTONIO BATRES,
Envoy Extraordinary and Minister Plenipotentiary.

On behalf of Spain,

Mr. JUAN VALERA,
Envoy Extraordinary and Minister Plenipotentiary.
Mr. EMILIO RUIZ DEL ARBOL,
Naval Attaché to the Spanish Legation.
Mr. JUAN PASTORIN,
Officer of the Navy.

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On behalf of Sweden—

Count CARL LEWENHAUPT,
Envoy Extraordinary and Minister Plenipotentiary.

On behalf of Switzerland—

Colonel EMILE FREY,
Envoy Extraordinary and Minister Plenipotentiary.

On behalf of the United States—

Rear-Admiral C. R. P. RODGERS,
U. S. Navy.

Mr. LEWIS M. RUTHERFURD.

Mr. W. F. ALLEN,
Secretary Railway Time Conventions.

Commander W. T. SAMPSON,
U. S. Navy.

Professor CLEVELAND ABBE,
U. S. Signal Office.

On behalf of Venezuela—

Señor Dr. A. M. SOTELDO,
Chargé d'Affaires.

The following delegates were not present:

On behalf of Chili—

Mr. FRANCISCO VIDAL GORMAS,
Director of the Hydrographic Office.

Mr. ALVARO BIANCHI TUPPER,
Assistant Director.

On behalf of Denmark—

Mr. CARL STEEN ANDERSEN DE BILLE,
Minister Resident and Consul-General.

On behalf of Germany—

Mr. HINCKELDEYN,
Attaché of the German Legation.

On behalf of Liberia—

Mr. WILLIAM COPPINGER,
Consul-General.

On behalf of the Netherlands—

Mr. G. DE WECKHERLIN,
Envoy Extraordinary and Minister Plenipotentiary.

On behalf of Turkey—

RUSTEM EFFENDI,
Secretary of Legation.

The delegates were formally presented to the Secretary of State of the United States, the Honorable FREDERICK T. FRELINGHUYSEN, in his office at 12 o'clock. Upon assembling in the Diplomatic Hall, he called the Conference to order, and spoke as follows:

GENTLEMEN: It gives me pleasure, in the name of the President of the United States, to welcome you to this Congress, where most of the nations of the earth are represented. You have met to discuss and consider the important question of a prime meridian for all nations. It will rest with you to give a definite result to the preparatory labors of other scientific associations and special congresses, and thus make those labors available.

Wishing you all success in your important deliberations, and not doubting that you will reach a conclusion satisfactory to the civilized world, I, before leaving you, take the liberty to nominate, for the purpose of a temporary organization, Count Lewenhaupt.

It will afford this Department pleasure to do all in its power to promote the convenience of the Congress and to facilitate its proceedings.

By the unanimous voice of the Conference the Delegate of Sweden, Count LEWENHAUPT, took the chair, and said that, for the purpose of proceeding to a permanent organization, it was necessary to elect a President, and that he had the honor to propose for that office the chairman of the delegation of the United States of America, Admiral C. R. P. Rodgers.

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The Conference agreed unanimously to the proposition thus made, whereupon Admiral RODGERS took the chair as President of the Conference, and made the following address:

GENTLEMEN: I beg you to receive my thanks for the high honor you have conferred upon me in calling me, as the chairman of the delegation from the United States, to preside at this Congress. To it have come from widely-separated portions of the globe, delegates renowned in diplomacy and science, seeking to create a new accord among the nations by agreeing upon a meridian proper to be employed as a common zero of longitude and standard of time reckoning throughout the world. Happy shall we be, if, throwing aside national preferences and inclinations, we seek only the common good of mankind, and gain for science and for commerce a prime meridian acceptable to all countries, and secured with the least possible inconvenience.

Having this object at heart, the Government of the United States has invited all nations with which it has diplomatic relations to send delegates to a Congress to assemble at Washington to-day, to discuss the question I have indicated. The invitation has been graciously received, and we are here this morning to enter upon the agreeable duty assigned to us by our respective governments.

Broad as is the area of the United States, covering a hundred degrees of longitude, extending from 66° 52' west from Greenwich to 166° 13' at our extreme limit in Alaska, not including the Aleutian Islands; traversed, as it is, by railway and telegraph lines, and dotted with observatories; long as is its sea coast, of more than twelve thousand miles; vast as must be its foreign and domestic commerce, its delegation to this Congress has no desire to urge that a prime meridian shall be found within its confines.

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In my own profession, that of a seaman, the embarrassment arising from the many prime meridians now in use is very conspicuous, and in the valuable interchange of longitudes by passing ships at sea, often difficult and hurried, sometimes only possible by figures written on a black-board, much confusion arises, and at times grave danger. In the use of charts, too, this trouble is also annoying, and to us who live upon the sea a common prime meridian will be a great advantage.

Within the last two years we have been given reason to hope that this great desideratum may be obtained, and within a year a learned Conference, in which many nations were represented, expressed opinions upon it with singular unanimity, and in a very broad and catholic spirit.

I need not trespass further upon your attention, except to lay before you the subject we are invited to discuss: the choice of "a meridian to be employed as a common zero of longitude and standard of time reckoning throughout the world;" and I shall beg you to complete our organization by the election of a Vice-President, and the proper Secretaries necessary to the verification of our proceedings.

Mr. LEFAIVRE, Delegate from France, stated that on behalf of his colleague he would suggest that all motions and addresses made in English should be translated into French.

The PRESIDENT inquired whether the proposition made by the Delegate for France met with the approval of the Conference, when it was unanimously agreed to.

The PRESIDENT thereupon said that he was ready to lay before the Conference the subject of the election of Vice-President.

Count LEWENHAUPT, the Delegate of Sweden, stated that elections in such large bodies were always difficult, and inquired whether it was necessary to have a Vice-President. He further said that for his part he had every reason to hope and to expect that the services of a Vice-President would not be required.

It was thereupon agreed that a Vice-President should be dispensed with.

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The PRESIDENT then stated that the next business was the election of Secretaries; but suggested, in view of the proceedings already had, and of the necessity of some consultation in regard to the matter, that the election might be postponed till to-morrow.

Mr. VALERA, Delegate of Spain, stated that he saw no reason why the nomination of Secretaries could not be made just as well at present as at any future time.

Mr. LEFAIVRE, Delegate of France, inquired what would be the functions of the Secretaries.

The PRESIDENT in reply said that an acting Secretary had been appointed by the Secretary of State, who was at the same time a stenographer, and that the principal labor of keeping the records of the Conference would devolve upon him; that nevertheless regular Secretaries of the Conference had to be appointed, for the purpose of examining and verifying the protocols from day to day, which would be the more important in the event of the records of the Conference being made in two or three different languages, and that these Secretaries ought no doubt to be members of the Conference, in order to give the requisite authenticity to the acts thereof, and, in view of the character of the proceedings, should be specialists and informed as to the subjects under discussion.

Mr. SOTELDO, Delegate of Venezuela, said that he thought the Conference should adjourn until to-morrow, as they had done already enough to-day in settling its organization; that by adjourning over it would give an opportunity to the delegates to consult as to the functions of the Secretaries, and who would be most likely to be qualified for those functions; that there were gentlemen from different countries who were not familiar with the English language, and by to-morrow the Conference could determine as to the languages in which the proceedings should be had, although, as it seemed to him, that the proceedings should be recorded in French and English. He then moved that the Conference adjourn until to-morrow.

Mr. LEFAIVRE, Delegate of France, stated that he agreed with what had been said by the President, that the Conference should have Secretaries who were specialists, and that the proceedings should be recorded in two languages. By adjourning till to-morrow he thought that the delegates would have an opportunity to reflect upon the subject, and to come back prepared to vote upon it.

The PRESIDENT then stated that if any delegates wished to make propositions in regard to the proceedings to-morrow it would be in the power of the Conference to proceed to the consideration of those subjects after the election of the Secretaries, and he suggested to the Delegate of Venezuela (Mr. Soteldo) that the motion to adjourn be withdrawn for the present.

The Delegate of Venezuela thereupon withdrew his motion.

Mr. FREY, Delegate of Switzerland, said that, in his opinion, the order of proceedings to-morrow should be first a general discussion.

Mr. VALERA, Delegate of Spain, stated that he thought the proceedings should be recorded in two languages at least, and that Secretaries conversant with these languages and specially acquainted with the subject matter pending before the Conference should be selected; that, in order to have the record of the proceedings accurate, officers qualified in this way were requisite, and that it would be preferable to elect these officers after consultation among the members of the Conference, which could be had between now and the meeting to-morrow.

Count LEWENHAUPT, Delegate of Sweden, said that he saw no difficulty in deciding now that the order of proceedings to-morrow would be first the election of the Secretaries and then a general discussion, and he moved that this proposition be adopted.

The Conference then unanimously agreed to the proposition.

Professor ABBE, Delegate of the United States, inquired whether it would not facilitate the action of the Conference to-morrow if the President appointed a committee now who could nominate the Secretaries.

The PRESIDENT replied by asking whether it would not be better to select this committee at a subsequent meeting, rather than at the first meeting, which was held to-day.

Commander SAMPSON, Delegate of the United States, then gave notice that at the session to-morrow he would bring before the Conference the question whether the meetings shall be open to the public or not, and that he would, at the proper time, also make a motion for the purpose of determining the sense of the Conference as to the propriety of inviting distinguished scientists, some of whom are now in Washington, and who may desire to be present at the meetings of this Conference, to take part in the discussion of the questions pending.

Mr. LEFAIVRE, Delegate of France, stated that in regard to the first proposition—that is, as to making the proceedings public, he would object, inasmuch as he thought that by opening the doors of this Conference to the public nothing could be gained, while the proceedings might be embarrassed or delayed by such a course.

Professor ADAMS, Delegate of England, stated that he did not favor the first proposition to make the proceedings of this Conference public, but he did agree with the second proposition, and thought it was a very important and valuable one.

The PRESIDENT remarked that the propositions made by the Delegate of the United States of America were merely in the nature of a notice, and that they were not before the Conference at the present time, and, consequently, were not the subject of discussion; still he thought that much good could be elicited from this interchange of opinions in a preliminary way.

Captain STEWART, Delegate of Paraguay, said that he thought that it would be a very good thing, in view of the proposition to make the meetings public, to invite all the world to the Capitol for the discussion of these subjects.

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Professor ABBE, Delegate of the United States, stated that it would be perfectly practicable to have the discussions of the Conference printed in full from day to day for our own official use, and that the public might thereby be made familiar with the proceedings if it were necessary.

The PRESIDENT announced that arrangements had been made by the State Department whereby the proceedings of each day would be printed and furnished in time for the examination of the members of the Conference before the next meeting, and that they would be printed in two languages, French and English; but that these records or protocols could not be regularly verified until the Conference shall have appointed duly authorized Secretaries.

Baron VON SCHÆFFER, Delegate of Austro-Hungary, asked that a list of the delegates be presented to each of the members of the Conference.

The PRESIDENT replied that he would instruct the acting Secretary (Mr. Peddrick) to have the list prepared.

Upon the motion of Mr. DE STRUVE, Delegate of Russia, the Conference then adjourned until tomorrow, (Thursday,) the second instant, at one o'clock p. m.

II.

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SESSION OF OCTOBER 2, 1884.

The Conference met pursuant to adjournment in the Diplomatic Hall of the Department of State, at one o'clock p. m.

Present:

Austria-Hungary: Baron IGNATZ VON SCHÆFFER.

Brazil: Dr. LUIZ CRULS.

Colombia: Commodore S. R. FRANKLIN.

Costa Rica: Mr. JUAN FRANCISCO ECHEVERRIA.

France: Mr. A. LEFAIVRE, Mr. JANSSEN.

Germany: Baron H. VON ALVENSLEBEN, Mr. HINCKELDEYN.

Great Britain: Sir F. J. O. EVANS, Prof. J. C. ADAMS,

Lieut.-General STRACHEY, Mr. SANDFORD FLEMING.

Guatemala: Mr. MILES ROCK.

Hawaii: Hon. W. D. ALEXANDER, Hon. LUTHER AHOLO.

Italy: Count ALBERT DE FORESTA.

Japan: Professor KIKUCHI.

Mexico: Mr. LEANDRO FERNANDEZ, Mr. ANSEL ANGUIANO.

Paraguay: Capt. JOHN STEWART.

Russia: Mr. C. DE STRUVE, Major-General STEBNITZKI, Mr.
KOLOGRIVOFF.

San Domingo: Mr. DE J. GALVAN.

Salvador: Mr. ANTONIO BATRES.

Spain: Mr. JUAN VALERA, Mr. EMILIO RUIZ DEL ARBOL,
and Mr. JUAN PASTORIN.

Sweden: Count CARL LEWENHAUPT.

Switzerland: Col. EMILE FREY, Professor HIRSCH.

United States: Rear-Admiral C. R. P. RODGERS, Mr. LEWIS
M. RUTHERFORD, Mr. W. F. ALLEN, Commander W. T.
SAMPSON, Professor CLEVELAND ABBE.

Venezuela: Señor Dr. A. M. SOTELDO.

Absent:

Chili: Mr. F. V. GORMAS and Mr. A. B. TUPPER.

Denmark: Mr. O. S. A. DE BILLE.

Liberia: Mr. WM. COPPINGER.

Netherlands: Mr. G. DE WECKHERLIN.

Turkey: RUSTEM EFFENDI.

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The PRESIDENT stated that the first business before the Conference was the election of Secretaries.

Mr. DE STRUVE, Delegate of Russia, stated that it was his opinion that it would be very difficult to elect Secretaries by a direct vote, and he proposed that the selection of the Secretaries be left to a Committee to be appointed by the President; that the Committee present the names of the officers selected to the Conference, and that these Secretaries be four in number.

Count LEWENHAUPT, Delegate of Sweden, stated that it was generally understood among the delegates that Mr. Hirsch, one of the delegates from Switzerland, should be elected a Secretary, as he was a Secretary of the Conference held at Rome, but as he has not yet arrived, he proposed that the Conference elect only three Secretaries to-day.

Mr. DE STRUVE, Delegate of Russia, stated that he believed that Mr. Hirsch would soon arrive, and he accepted the amendment just offered.

The original motion, as modified by the amendment, was thereupon unanimously agreed to.

The Chair appointed the Delegate of Russia, Mr. de Struve, the Delegate from Spain, Mr. Valera, the Delegate from France, Mr. Lefavre, and the Delegate from Sweden, Count Lewenhaupt, as the Committee to select the Secretaries.

The Conference thereupon took a recess, to enable the Committee to consult and report.

Upon the reassembling of the Conference, the Delegate of Sweden, Count Lewenhaupt, announced that the Committee had selected for Secretaries the Delegate from Great Britain, Lieut.-General Strachey, the Delegate of France, Mr. Janssen, and the Delegate from Brazil, Dr. Cruls.

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The report of the Committee was then unanimously adopted by the Conference, and the Delegates named as Secretaries signified their acceptance of the office.

Mr. DE STRUVE, Delegate of Russia, moved that the President direct the Acting Secretary to arrange the seats of the Delegates according to the alphabetical order of the countries represented. He added that it would be a great convenience to the members to have their seats permanently fixed.

The motion was unanimously agreed to.

Commander SAMPSON, Delegate of the United States, then presented the following resolution:

Resolved, That the Congress invite Prof. Newcomb, Superintendent of the United States Nautical Almanac; Prof. Hildgard, Superintendent of the United States Coast and Geodetic Surveys; Professor A. Hall; Professor De Valentiner, Director of the Observatory at Karlsruhe; and Sir William Thomson, to attend the meetings of this Congress.

General STRACHEY, Delegate of England, stated that, as he understood this resolution, it would not necessarily authorize the parties invited to take any part in the discussions.

The PRESIDENT stated that the resolution seems merely to invite the gentlemen to be present.

General STRACHEY, Delegate of Great Britain, stated that he thought it necessary to clear up this matter a little; that if the gentlemen invited could not address the Conference, it seemed very little use to have them invited; that it was not for their own advantage but for that of the Conference that the invitations were extended to those scientific gentlemen, and therefore he thought it was the intention in inviting them to have the benefit of any information which they might desire from time to time to express on the subjects before the Congress. He thought that if any remarks on the part of these gentlemen were presented to the Conference, with the assent of the Congress, through the President, that would doubtless meet all the requirements of the case.

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The PRESIDENT inquired whether the Delegate of Great Britain meant that the remarks should be presented in writing.

General STRACHEY, Delegate of Great Britain, replied that that would not necessarily be the case.

Prof. ABBE, Delegate of the United States, inquired whether the persons named in the resolution were the only ones to be invited.

The PRESIDENT replied that it was so, so far as the Chair was informed, but that it would be in order at any time to add new names in the same way.

Prof. ABBE, Delegate of the United States, stated that this was a matter which he had very much at heart, and he would like to observe that some of the nations which were invited to send Delegates to this Conference had failed to do so, and that it would be a courtesy to invite persons of those nations to be present.

Commander SAMPSON, Delegate of the United States, stated that after consulting with a number of the delegates he drew the resolution, and that it was suggested to him this very morning that possibly there might be a difference of opinion as to whether these gentlemen should take part in the discussion, and that that was the reason why the first resolution merely proposed to invite them to be present. He stated that he proposed subsequently to submit another resolution authorizing

these gentlemen to take part in the discussion; that he thought that the original intention was to confer an honor on certain distinguished scientists, and that it would be well for the Conference to limit the invitation to gentlemen of that character.

Mr. LEFAIVRE, Delegate of France, stated that he was opposed to the proposition to admit to the deliberations of this Conference gentlemen, no matter how distinguished or eminent they might be, who were not specially delegated by their Governments as members of this body. He questioned the power of the Conference to admit to its discussions persons who were not regularly appointed to vote upon the subject at issue; that this was an international conference created for the purpose of obtaining an interchange of views from the representatives of the different Governments; that it would extend the scope of the work before this body to entertain the views and opinions of persons not authorized to speak for the Governments whose Delegates are here; that there would be a great divergence of opinion among such men, and the result would be rather to embarrass than to help this Conference to an accord. He insisted that the matter was exclusively governmental, and, while he would be happy to extend any courtesy to men distinguished in science, such as the gentlemen who are proposed to be invited, he felt constrained to oppose the proposition under the circumstances.

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The PRESIDENT stated that he understood that the resolution did not propose to confer a vote upon the gentlemen invited, but simply to enable them to lay any information before the Conference which they might have upon the matter at issue.

Mr. LEFAIVRE, Delegate of France, contended that the resolution was intended to authorize these gentlemen to deliberate, and he thought that the inconvenience would be very great of extending this privilege to persons not authorized to represent their Governments. He did not think it was reasonable or fair that his opinions should be questioned or opposed by the opinions of men not authorized to speak for their Governments.

Gen. STRACHEY, Delegate of Great Britain, said that as he had taken upon himself to make some remarks both as to the manner in which the gentlemen should be invited and the extent of their rights when invited, he wished to say that while he agreed with much that had been said by the Delegate of France, he held that these gentlemen should have an opportunity of expressing their views; that they were not to come here merely to listen to the proceedings, but that they should themselves be heard.

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The PRESIDENT directed that the resolution be read in French, and then put it to the vote, when it was unanimously adopted.

Commander SAMPSON, Delegate of the United States, then offered the following resolution:

"Resolved, That the gentlemen who have just been invited to attend the meetings of the Conference be permitted to take part in the discussion of all scientific questions."

Mr. LEFAIVRE, Delegate for France, then stated that it was not in accordance with the object of this Conference that private individuals, not authorized by their respective Governments, should be permitted to influence the decision of this body, and that, while it was very proper to extend courtesy to such learned gentlemen as were invited, it surely was never intended that they should participate in our proceedings.

Gen. STRACHEY, Delegate of Great Britain, said that it would, perhaps, save trouble if he stated his views on the point under discussion, which he apprehended were generally in accordance with those of the representative from France. He said that, if he were permitted, he would read a resolution, which he suggested might be accepted as a substitute for that pending before the Conference, and it was as follows:

"*Resolved*, That the President be authorized, with the concurrence of the Delegates, to request an expression of the opinions of the gentlemen invited to attend the Congress on any subject on which their opinion may be likely to be valuable."

The PRESIDENT inquired in what way they would express it.

Gen. STRACHEY, Delegate of Great Britain, stated that it would be orally.

The PRESIDENT replied that the resolution undoubtedly read that way.

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Gen. STRACHEY, Delegate of Great Britain, stated that the language, "to take part in the discussion," employed in the resolution of Commander Sampson, would mean that the persons invited would be in a position, of their own motion, either to reply to remarks made, or to state their own views, or to take part in the discussion just as the Delegates are entitled to do.

Mr. LEFAIVRE, Delegate of France, stated that he hoped that the proposition of the Delegate of Great Britain would not be pressed until a vote was had upon the original resolution.

The PRESIDENT then put the resolution to a vote; but, being unable to determine from the *viva voce* vote whether it was carried or not, he stated that the roll would be called.

Mr. FREY, Delegate of Switzerland, stated that he thought before the vote was taken a decision should be had upon the question, how the Delegates were to vote—whether as nations or as individuals.

The PRESIDENT announced that it had been the custom in all such conferences to vote as nations, each nation casting one vote, and that no other way seemed practicable; and that in conformity with this ruling the roll would be called and the vote taken by nations.

The roll was then called, when the following States voted in the affirmative:

Costa Rica,	Guatemala,
Italy,	Mexico,
San Domingo,	Salvador,
Switzerland,	Venezuela.

And the following in the negative:

Austria-Hungary,	Brazil,
Colombia,	France,
Germany,	Great Britain,
Hawaii,	Japan,
Paraguay,	Russia,
Spain,	Sweden.
United States,	

The PRESIDENT then announced that the ayes were 8 and the noes 13, and that the resolution was lost.

Gen. STRACHEY, Delegate of Great Britain, then renewed his resolution, which was as follows:

"Resolved, That the President be authorized, with the concurrence of the Delegates, to request an expression of the opinions of the gentlemen invited to attend the Congress on any subject on which their opinion may be likely to be valuable."

No discussion arose upon this resolution, and it was adopted.

Commander SAMPSON, Delegate of the United States, then offered the following resolution:

"Resolved, That the meetings of this Congress be open to interested visitors."

Mr. LEFAIVRE, Delegate of France, stated that he considered this a subject of grave importance; that this was an official and confidential body; scientific, it was true, but also diplomatic; that it was empowered to confer about matters with which the general public have now nothing to do; that to admit the public to the meetings would destroy their privacy and subject the Conference to the influence of an outside pressure which might prove very prejudicial to its proceedings, and that he would object to this resolution absolutely.

No further discussion being had, the PRESIDENT, after a *viva voce* vote of doubtful result, ordered the roll to be called, when the following States voted in the affirmative:

Colombia,	Costa Rica,
Guatemala,	Paraguay,
Salvador,	Spain.
Venezuela,	

And the following States in the negative.

Austria-Hungary,	Brazil,
France,	Germany,
Great Britain,	Hawaii,
Italy,	Japan,
Mexico,	Russia,
San Domingo,	Sweden,
Switzerland,	United States.

The PRESIDENT then announced that the ayes were 7 and the noes 14, and that the resolution was therefore lost.

The PRESIDENT then said that there would doubtless be some preliminary general discussion on the subject before the Conference, and suggested that if Delegates desired to be heard upon the subject it would be expedient to give an intimation to the Secretary.

Prof. ABBE, Delegate of the United States, then said: I have been requested to present to the Conference the communication that I hold in my hand, and in doing so wish to offer the following resolution:

"Whereas several persons desire to submit to this Conference inventions, devices, and systems of universal time: therefore,

"Resolved, That the Conference will acknowledge the receipt of such communications, but will abstain from any expression of opinion as to their respective merits."

Professor ADAMS, Delegate of Great Britain, said that the Conference should be very cautious in admitting the devices and schemes of people who have no connection with this body; that there are, no doubt, many inventors and many people who have plans and schemes which they wish to press upon the Conference, and that it was probable that the Conference would be subjected to very great inconvenience if they took upon themselves even the burden of acknowledging the receipt of these communications.

The PRESIDENT stated that he had received several Communications of this character, one proposing that Jerusalem should be taken as the prime meridian.

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Mr. LEFAIVRE, Delegate of France, proposed that the Conference should appoint a committee to examine the different papers submitted by outside parties, and to make such suggestions as they might deem proper after examining the papers.

Mr. VALERA, Delegate of Spain, said that it seemed to him the proper course of proceeding for the Conference was to take up the subject article by article, and treat it in that order; that there were presented to the Conference certain well-defined propositions, and that besides these there were the resolutions which had been adopted by the Conference at Rome, which could be used as a basis for the discussions of this Conference; that in that way the Delegates would have before them some precise subject-matter, and after discussion, if any proposition needed to be altered or amended it would be in the power of the Conference to do so, but that unless some regular method of proceeding were adopted the sessions would be prolonged indefinitely, and the Conference would be confused by a multitude of irrelevant propositions that might be presented to them.

Mr. RUTHERFURD, Delegate of the United States, stated that it seemed to him that to invite a general discussion upon the subject, which has undoubtedly a great many heads, the best method would be the one just suggested; that by having a well-defined course much time would be saved, and there would be a precision in the proceedings, which undoubtedly is always valuable; that in this way the discussion could be kept within bounds, but unless there is some proposition pending before the Conference it is impossible to say whether any discussion is in order or out of order; that it seemed to him there should be some well-defined propositions laid before the Conference, and those propositions could easily be gathered, not only from what has gone before, not only from the Conference which has been held in Rome, but from the acts of Congress and the circulars of the Secretary of State, under which this body has been organized.

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The PRESIDENT stated that if these communications from outside parties were brought before the Conference it would entail a great deal of labor.

The resolution of the Delegate of the United States, Prof. ABBE, was then put to the vote, and was negatived.

Mr. RUTHERFURD, Delegate of the United States, then presented the following resolution:

"Resolved, That the Conference proposes to the Governments represented the adoption as a standard meridian that of Greenwich passing through the centre of the transit instrument at the Observatory of Greenwich."

Mr. LEFAIVRE, Delegate of France, remarked that the proposed resolution seemed to him out of order, and that his colleague, Mr. Janssen, desired to address the Conference on the subject. He went on to say:

The competence of the Conference can give rise to no long debate among us. Let us remark, in the first place, that no previous engagement exists, on the part of the Governments, to adopt the results of our discussions, and that consequently our decisions cannot be compared to those of a deliberative congress or an international commission acting according to definite powers.

We have no definite powers, or rather, we have no executive power, since our decisions cannot be invoked executively by one Government towards others.

Does this mean that our decisions will be wholly unauthoritative? An assembly which numbers so many eminent delegates, and in which there is so much scientific knowledge, must certainly be regarded with profound respect by all the Powers of the world. Its powers, however, must be of a wholly moral character, and will have to be balanced against rights and interests no less worthy of consideration, leaving absolutely intact the independence of each individual State.

Under these circumstances, gentlemen, it seems to me that our course is already marked out for us. From our Conference is to be elicited the expression of a collective wish, a draft of a resolution, which is to be adopted by the majority of this assembly, and afterwards submitted to the approval of our respective Governments.

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This is our mission. It is a great one, and has a lofty international bearing. We must, however, realize its extent from the very outset, and not go beyond its limits.

An appeal has been made to the decisions of the Conference held at Rome. But, gentlemen, I beg leave to remark that that Conference was composed entirely of specialists, and that it did not meet for the purpose of examining the question in an international point of view. This Conference is composed of various elements, among which are scientists of the highest standing, but also functionaries of high rank, who are not familiar with scientific subjects, and who are charged with an examination of this question from a political stand-point. It is, moreover, our privilege to be philosophers and cosmopolitans, and to contemplate the interests of mankind not only for the present, but for the most distant future.

You see, gentlemen, that we enjoy absolute freedom, and that we are in nowise bound by the decisions of the Conference held at Rome. It is even desirable that those precedents should be appealed to as little as possible, inasmuch as we have scientists among us who are regarded as authorities in both the Old and the New World, and who are perfectly capable of directing us in technical matters, and of furnishing all the information that we can desire. I will say even more than this: The results of the Conference held at Rome are by no means regarded as possessing official authority by the Governments that have accredited us; for if those results had been taken as a starting point, there would be no occasion for our Conference, and our Governments would simply have to decide with regard to the acceptance or rejection of the resolutions adopted by the Geodetic Congress at Rome.

Everything, however, is intact, even the scientific side of the question, and that is the reason why we have so many Delegates possessing technical knowledge among us.

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The PRESIDENT stated that he considered the resolution entirely in order, and likely to bring about a discussion upon the very point for which this Conference was called together; that the resolution was open to any amendment that might be offered, could be altered from time to time if necessary, and, if it did not meet the sense of the Conference, could be defeated.

Mr. LEFAIVRE, Delegate of France, inquired whether this proposition did not demand an immediate solution.

Mr. RUTHERFURD, Delegate of the United States, replied that no such thing was contemplated.

Prof. JANSSEN, Delegate of France, then spoke as follows:

GENTLEMEN: I formally request that the resolution just proposed by my eminent colleague and friend, Mr. Rutherford, be held in reserve, and that it may not now be pressed for discussion.

It is wholly undesirable that a proposition of so grave a character, which forestalls one of the most important resolutions that we shall be called upon to adopt, should be put to the vote while our meeting has scarcely been organized, and before any discussion relative to the true merits of the questions to be considered has taken place.

This would be inverting the proper order of things and reaching a conclusion before having examined the subject before us.

Before discussing the question of the selection of a meridian which is to serve as a common zero of longitude for all the nations of the world, (if the Congress shall think proper to discuss that point,) it is evident that we must first decide the question of principle which is to govern all our proceedings; that is to say, whether it is desirable to fix upon a common zero of longitude for all nations. I therefore formally ask for the withdrawal of Mr. Rutherford's proposition.

The PRESIDENT stated that as something had been said about the Conference at Rome, he desired to say that he had carefully abstained from any allusion to it, and that the delegation of the United States found no allusions to it in their instructions; that, so far as the Chair understood the resolution offered by the Delegate of the United States, it was simply to bring before the Conference the consideration of the subject of a prime meridian; that he did not understand that even the Delegate who presented the motion offered it as an expression of his own opinion on the subject, but that he had carefully stated, when he had brought the resolution before the Conference, that it was for the purpose of enabling the Delegates to proceed to an immediate discussion. He added, further, that the resolution was quite open to amendment in case the Delegates from France desired to amend it.

Commander SAMPSON, Delegate of the United States, stated that he wished to offer the following as a substitute for the resolution already pending:

"Resolved, That it is the opinion of this Congress that it is desirable to adopt a single prime meridian for all nations in place of the multiplicity of initial meridians which now exist."

Mr. RUTHERFURD, Delegate of the United States, then announced that he accepted this substitution in place of the first resolution.

General STRACHEY, Delegate of England, stated that if he rightly understood the remarks made by the Delegate of France, Mr. LEFAIVRE, he thought that it was intended to call attention to the ultimate form in which the resolutions of this Congress should be recorded. He referred to the address which the Secretary of State of the United States (Mr. FRELINGHUYSEN) made to the Delegates on their assembling, in which he said: "You have met to discuss and consider the important question of a prime meridian for all nations. It will rest with you to give a definite result to the preparatory labors of other scientific associations and special congresses, and thus make those labors available."

He added that the object at which they should aim was to put together a series of resolutions which could be presented to the various Governments whose representatives are here present, with a view to inducing them to accept the decision which may be arrived at by this Conference, and, finally, to put that decision in a diplomatic form—a form which shall be more definite and precise than the mere resolutions which would be adopted by a purely scientific body; this he understood to be the position to be adopted by the Delegates to this Conference. He then said that it seemed to him that it would be necessary, after settling the original shape of the resolutions, that they should be reconsidered and afterwards put together in an orderly way, in a manner which would give a regular and satisfactory record of the proceedings; that it appeared almost certain to him that the discussions would be desultory in their nature, but that ultimately a revision would be had after the rough-hewing of the blocks out of which the edifice was to be formed; that he had no wish, at the present stage of the discussion, to go into the merits of the question presented; that, for his part, he thought it more prudent to abstain, but that with reference to the remarks of his honorable friends from France, he could not agree that they should set aside what occurred at Rome; that the discussions at Rome were most valuable; they went thoroughly into the whole question, and he apprehended that every gentleman in the Conference was possessed of the records of what occurred there.

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He continued by saying that he thought that the Delegate from France, Mr. LEFAIVRE, went a little beyond what was strictly right in saying that we should shut our eyes to what occurred there; that, for his own part, he was obliged to pay attention to what occurred there; that some of the most eminent scientific men to be found in any country met there and fully discussed the questions now before us, and that the Delegates here present were now called upon to revise what occurred there.

Mr. RUTHERFURD, Delegate of the United States, said that the Delegate from France, Mr. LEFAIVRE, in his remarks, insisted that we should first establish for what purpose the Delegates were here assembled; that he wished to refer to the circulars sent out by the Government of the United States, under which this Conference was called together. He said that he could assert, without fear of contradiction, that in those communications the President stated that it was believed to be a foregone conclusion that a prime meridian was desirable; that that was the basis on which the President acted in giving his invitation; that how he came to that conclusion he does not state—whether or not the proceedings at Rome had anything to do with it, but he thought that they had a great influence on the mind of the President; that, doubtless, his action was not determined solely by that, and, therefore, that the Secretary of State first made a tentative application to see whether a proposition for another Conference was acceptable, and that he found all countries here represented answering the circular in the affirmative; that they agreed with him that a conference for this purpose was desirable.

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He continued by saying that the Secretary of State then sent a second invitation to the different nations to send Delegates, who were to assemble here on the first of October, 1884, for the purpose of establishing a prime meridian and a universal time. He added that it seemed to him a great loss of time to go over the question whether a prime meridian was or was not desirable; that the Delegates were sent here for the purpose of agreeing upon a prime meridian. He then asked why this Conference should lose time in discussing that question.

The resolution offered by the Delegate of the United States, Commander SAMPSON, was then unanimously adopted as follows:

"Resolved, That it is the opinion of this Congress that it is desirable to adopt a single prime meridian for all nations in place of the multiplicity of initial meridians which now exist."

Mr. RUTHERFURD, Delegate of the United States, then renewed his original resolution, as follows:

"Resolved, That the Conference proposes to the Governments represented the adoption as a standard meridian that of Greenwich, passing through the centre of the transit instrument at the Observatory of Greenwich."

Mr. JANSSEN, Delegate of France, stated that he wished to reiterate the objections that he had already offered to the first resolution, and spoke as follows:

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GENTLEMEN: Mr. Lefaivre, my honorable colleague, and I are of the opinion that the mission of this Congress is chiefly to examine questions of principle.

I consider that we shall do a very important thing if we proclaim the principle of the adoption of a meridian which shall be the same for all nations.

The advantages of such a meridian have been felt by the geographers and navigators of all ages. France might claim the honor of having sought to accomplish this reform as early as the seventeenth century. It is not to be expected, therefore, that France, at this late day, will seek to place any obstacles in the way of the adoption of an improvement which would by this time have been adopted if the use of the meridian which she proposed, and which she had caused to be generally accepted, had been continued.

We therefore fully agree with you, gentlemen, as to the principle of a common international meridian, impartially defined and wisely applied, and we think that if the Congress should cause a useful reform, which has been so long expected, to be finally adopted, it would render a great service to the world, and one that would do us the highest honor.

This point being gained, is it proper for us to proceed to the adoption of such a meridian? We think not, unless we are assured by a previous declaration as to the principle which is to govern the selection of that meridian. Without such a declaration, we should have no power to begin a discussion on an undefined subject, and we are not authorized to pledge ourselves.

I must even add that our acquiescence in the principle of an international meridian could not be maintained if the Congress proceeded to a choice at variance with the exclusively scientific principles which we are instructed to maintain. Thus, in the very interest of the great principle which we all desire to see adopted, it would, to my way of thinking, be wiser to confine ourselves to a general declaration which, by uniting the opinions of all, would sustain the principle with all

the authority possible. The principle having once been adopted, our Governments would subsequently convoke a conference of a more technical character than this, at which questions of application would be more thoroughly examined.

Mr. VALERA, Delegate of Spain, stated that it seemed to him the order of proceeding for this Conference was very well laid down in the invitations addressed by the President of the United States to the different countries and in the articles which were formulated at Rome; that if these were taken up one after the other and discussed there would be a clearly-defined line of action for the Delegates; that if an article was not satisfactory it could be altered or amended, or could be rejected; but if the propositions were taken up one at a time and the discussions directed to these propositions, the Conference would be more likely to reach a definite result than in any general discussion.

The PRESIDENT stated that, so far as he understood the proposition, there was no desire to press it to an immediate vote; that it was quite proper for the Delegate from France to offer any other proposition, as suggested by the Delegate of Spain, in lieu of the motion now pending; that so far as the Chair was concerned it seemed to him that the Conference could at once proceed to the discussion of the general subject of a prime meridian under the pending resolution; that if the Delegate from France desires to make any other proposition, or offer anything else in a distinct form, he will be listened to with great attention and with profound respect.

Mr. RUTHERFURD, Delegate of the United States, remarked that the Delegate from France, his learned friend, Mr. JANSSEN, had expressed the opinion that the Delegates had not the power to decide upon any particular meridian, but that they were sent here merely to discuss this principle, namely, whether a general meridian was desirable. He added that he was, of course, not in possession of the instructions which the Delegates from France received from their own Government, but that he found among the instructions received by the Delegates of the United States from their Government a copy of one of the communications made by the President of the United States to France, as well as to the other nations, through the Secretary of State, in which was this language:

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"I am accordingly directed by the President to request you to bring the matter to the attention of the Government of —, through the Minister for Foreign Affairs, with a view to learning, whether its appreciation of the benefits to accrue to the intimate intercourse of civilized peoples from the consideration and adoption of the suggested common standard of time, so far coincides with that of this Government as to lead it to accept an invitation to participate in an International Conference at a date to be designated in the near future."

The Delegate of the United States continued by saying that the whole object of this Conference was not to establish the principle that it is desirable to have a prime meridian, but to fix that prime meridian; that that was the object of the meeting, and that it seemed to him that there must be some misapprehension on the part of the learned gentleman from France in thinking that this Conference has not the power to fix upon a prime meridian; that as to our organization, the Delegate of France (Mr. Lefavre) spoke of its not being sufficiently complete to take up this subject at present, but that it seemed to him that the Delegates undoubtedly were ready to hear and express arguments *pro* and *con* in regard to that question; that he supposed that every Delegate had studied this matter before coming here, and that he did not think that any Delegate would be likely to come here unless he knew, or thought he knew, some thing about this matter.

Mr. VALERA, Delegate from Spain, announced that he had no power to pledge his country on this subject; that his authority merely extended to the power of recommending to his Government such resolutions as this Conference might adopt.

Count LEWENHAUPT, Delegate of Sweden, then said: "I desire to state in the protocol that I have no power to engage my Government by my votes on the different questions which will be submitted to this Conference, and that, therefore, these votes must only be considered as an engagement on my part to recommend to my Government the decisions for which I vote."

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General STRACHEY, Delegate of Great Britain, said that in the name of the Delegates of Great Britain he wished to state that they were in the same position, but that would not prevent them or this Conference from forming an opinion and expressing it.

The PRESIDENT stated that on behalf of the Delegates from the United States they had no power except that of discussion and recommendation.

Mr. DE STRUVE made, on behalf of the Delegates of Russia, a declaration identical with that made by the Delegate of Sweden.

Baron VON ALVENSLEBEN, Delegate from Germany, made the same announcement on behalf of his Government.

Mr. FERNANDEZ, Delegate from Mexico, made the same announcement.

Mr. VALERA, Delegate of Spain, remarked that this Conference was called together not merely to discuss the subject of a prime meridian, but to determine, so far as these Delegates were concerned, the propriety of adopting a particular prime meridian, and that his Government would decide afterwards whether it would accept what this Conference should recommend.

Dr. CRULS, Delegate of Brazil, stated that his Government authorized him to take part in the discussion, but not to commit his Government to the adoption of any particular proposition.

Mr. FLEMING, Delegate of Great Britain, said that he would like to call the attention of the Conference to the language of the act of Congress calling this Conference together, and that language runs as follows:

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"That the President of the United States be authorized and requested to extend to the Governments of all nations in diplomatic relations with our own an invitation to appoint delegates to meet delegates from the United States in the city of Washington, at such time as he may see fit to designate, for the purpose of fixing upon a meridian proper to be employed as a common zero of longitude and standard of time-reckoning throughout the globe."

He added that he thought the object of the Conference clearly was to determine and to recommend; that although the word "recommend" was not used in the body of the resolution, it was certainly understood, and, as a matter of fact, the title of the joint resolution passed by Congress contains the word "recommend." It reads as follows:

"An act to authorize the President of the United States to call an international conference to fix on and recommend for universal adoption a common prime meridian, to be used in the reckoning of longitude and in the regulation of time throughout the world."

Baron von Schæffer, Delegate of Austria-Hungary, then moved that the Conference adjourn until Monday, the 6th instant, at one o'clock, to enable Delegates to confer on this subject.

The proposition of the Delegate of Austria-Hungary was then agreed to, and the Conference adjourned to Monday, October 6, 1884, at 1 o'clock, p. m.

III.

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SESSION OF OCTOBER 6, 1884.

The Conference met pursuant to adjournment in the Diplomatic Hall of the Department of State, at one o'clock p. m.

Present:

Austro-Hungary: Baron IGNATZ VON SCHÆFFER.

Brazil: Dr. LUIZ CRULS.

Colombia: Commodore S. R. FRANKLIN.

Costa Rica: Mr. JUAN FRANCISCO ECHEVERRIA.

France: Mr. A. LEFAIVRE, Mr. JANSSEN.

Germany: Baron H. VON ALVENSLEBEN, Mr. HINCKELDEYN.

Great Britain: Capt. Sir F. J. O. EVANS, Prof. J. C. ADAMS,

Lieut.-General STRACHEY, Mr. SANDFORD FLEMING.

Guatemala: Mr. MILES ROOK.

Hawaii: Hon. W. D. ALEXANDER, Hon. LUTHER AHOLO.

Italy: Count ALBERT DE FORESTA.

Japan: Professor KIKUCHI.

Mexico: Mr. LEANDRO FERNANDEZ, Mr. ANGEL ARGUIANO.

Paraguay: Capt. JOHN STEWART.

Russia: Mr. C. DE STRUVE, Major-General STEBNITZKI, Mr.

KOLOGRIVOFF.

San Domingo: Mr. DE J. GALVAN.

Salvador: Mr. ANTONIO BATRES.

Spain: Mr. JUAN VALERA, Mr. EMILIO RUIZ DEL ARBOL, Mr.

JUAN PASTORIN.

Sweden: Count CARL LEWENHAUPT.

Turkey: RUSTEM EFFENDI.

United States: Rear-Admiral C. R. P. RODGERS, Mr. LEWIS

M. RUTHERFURD, Mr. W. F. ALLEN, Commander W. T.

SAMPSON, Professor CLEVELAND ABBE.

Venezuela: Dr. A. M. SOTELDO.

Mr. RUTHERFURD, Delegate of the United States, said that the resolution offered by him at the last meeting omitted to state that the proposed meridian was for longitude, and he would offer the following as a substitute therefor:

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"Resolved, That the Conference proposes to the Governments here represented the adoption of the meridian passing through the centre of the transit instrument at the Observatory of Greenwich as the standard meridian for longitude."

The PRESIDENT then asked if the Conference would permit the substitution to be made, and it was unanimously agreed to.

Mr. RUTHERFURD, Delegate of the United States, stated that he did not propose to press the resolution to an early vote, but that it was offered simply to elicit the opinions of Delegates on the subject. He further stated that, having heard that the Delegates of France, Mr. LEFAIVRE and Mr. JANSSEN, desired to present certain propositions, he would, for that purpose, move to withdraw for the time being the resolution offered by him.

No objection being made, the resolution was temporarily withdrawn.

Mr. LEFAIVRE, Delegate of France, then made the following statement:

Our colleague, Mr. RUTHERFURD, having withdrawn his motion for the adoption of the meridian of Greenwich, we, the Delegates of France, after consultation with him, submit the following motion:

"Resolved, That the initial meridian should have a character of absolute neutrality. It should be chosen exclusively so as to secure to science and to international commerce all possible advantages, and in particular especially should cut no great continent—neither Europe nor America."

Sir F. J. O. EVANS, Delegate of Great Britain, then stated that he presumed the Conference could hardly pass by the important meeting held at Rome, where twelve of the thirty-eight Delegates were directors of national observatories, and where the subject of the conditions which should attach to a prime meridian were discussed without reference to any particular nationality; that these learned gentlemen came to the conclusion (which he thought was a very wise one) that the necessity existed for a prime meridian that it should pass through an astronomical observatory of the first order; that modern science demanded such precision, and therefore they excluded all ideas of a meridian being established on an island, in a strait, on the summit of a mountain, or as indicated by a monumental building. Looking at the subject in its various aspects, they came to the conclusion that there were only four great observatories which in their minds combined all the conditions, and this decision was unanimously received by that Conference. Those great observatories were Paris, Berlin, Greenwich, and Washington. He stated further that, having this in view, he thought this Conference should be particularly guarded, looking at the question from a scientific point of view, not to depart from the conditions laid down by the Conference at Rome; that he had no desire to advocate any one of the places enumerated, but merely mentioned them as satisfying all the conditions of science, which was so brilliantly represented at Rome.

Commander SAMPSON, Delegate of the United States, then said:

I can only attempt to anticipate the arguments which may be advanced by the learned Delegate from France in support of his resolution to adopt a neutral meridian. But it is our simple duty, in our present judicial capacity, to examine the question of a prime meridian from all points of view. With the object, then, of considering the question from another stand-point, I ask your attention for one moment. This Congress, at its last meeting, by a unanimous vote, declared its opinion that it was desirable to adopt a single prime meridian for the purpose of reckoning longitude. Further, it is fair

to assume that the delegates here assembled, in answer to a specific invitation from the Government of the United States, and for a stated purpose, have come empowered by their respective governments to act upon the questions submitted for their consideration in the invitation.

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At the last meeting, the Delegates from France left us somewhat in doubt regarding their views upon this important question of the powers of the delegates, or at least of their own delegation. But as they have to-day advocated the adoption of a neutral meridian, we may conclude that they have the necessary delegated power to fully consider and determine the main question before us—the selection of a prime meridian.

In the absence of any declared opinion to the contrary, we may take it for granted that the Delegates from all States here represented are deputed to "fix upon a meridian proper to be employed as a common zero of longitude throughout the globe," and to recommend the same for adoption to their respective Governments.

If, then, we are of one mind as to the desirability of a single prime meridian, and if we are fully empowered to make the selection, which may be taken as another way of saying that we are directed by our respective Governments to make the selection, we may proceed directly to the performance of this duty.

In the choice of a prime meridian, there is no physical feature of our earth which commends itself above others as the best starting point; nor does the form of the earth itself present any peculiarity which might be used as an initial point. If the refinements of geodesy should finally lead to the conclusion that the figure of the earth is an ellipsoid with three axes, yet the question of the direction of either of the equatorial axes must remain to such a degree uncertain that the extremity of the axis could not be assumed as the point of departure for counting longitude. Indeed, as an initial meridian must above all things be fixed in position, it would not answer to make its position depend upon any physical constant which is itself in the slightest degree uncertain; for in these days, when refinements in physical measurements are constantly leading to more and more accurate results, each advance in accuracy would necessitate an annoying change in the initial meridian, or, what would more probably result, the retention of the first chosen meridian, which would thus lose its dependence upon the original definition, and become as arbitrary as if taken by chance in the first instance.

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We may then say that, from a purely scientific point of view, any meridian may be taken as the prime meridian. But from the standpoint of convenience and economy there is undoubtedly much room for a choice.

Considering this question of convenience in connection with the necessary condition of fixity already referred to, the prime meridian should pass through some well-established national observatory.

In making the choice of a prime meridian which is to serve for a great period of time, it is important to so fix and define it that the natural changes of time may not render it in the least degree uncertain. To this end, the nation within whose borders the chosen point may fall should engage to establish it in the most enduring manner, and protect it against all possible causes of change or destruction.

When taken in connection with other requirements, to be mentioned hereafter, this character of permanence will be best secured by making the adopted meridian pass through an observatory which is under the control of the Government.

Such observatory should be in telegraphic communication with the whole world, in order that the differences of longitude from the prime meridian may be determined for any point. These conditions of convenience are so important that they may fairly be considered imperative. To fulfil them one of the national meridians now in use should be selected. To select any other than one of these meridians, or a meridian directly dependent upon one of them, and defined simply by its angular distance from one of these national meridians, would be to introduce endless confusion into all charts and maps now in use.

To select as a prime meridian one which shall be a defined angular distance from one of the national meridians, must have for its object either to remove some inconvenience which results from the use of the national meridian itself, or it must be to satisfy a desire to deprive the selected meridian of any nationality.

The inconvenience of east and west longitudes, which results from having the prime meridian pass through a thickly populated portion of the world, will be removed by reckoning the longitude continuously from 0° to 360° . At the same time an important advantage is secured by having the prime meridian occupy a central position with regard to the most densely populated part of the earth; because the distances which will then separate the various points from the central observatory marking the initial meridian will be a minimum, and consequently less liable to error in determination. The selection of a meridian by calculation, defined as a certain number of degrees east or west of one of the national meridians, would not thereby deprive the meridian thus selected of a national character; for though we may reckon longitude from a meridian passing through the Atlantic or Pacific Ocean, yet the initial point from which all measurements of longitude must be made would still remain one of the national meridians. Again, if any other than one of the national meridians were selected, or a meridian dependent upon one of them, as, for example, a neutral meridian in the Atlantic or Pacific Ocean, it would necessitate a change in all charts and maps.

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It is hardly necessary to say that no scientific or practical advantage is to be secured by adopting the meridian of the great pyramid, or by attempting to establish permanent meridian marks over a great length of the selected meridian, for even in the present advanced condition of astronomical and geodetic science it is not practicable to establish two points on the same meridian at a considerable distance from each other with such a degree of accuracy as would warrant the use of them indifferently as the initial point.

As a matter of economy as well as convenience that meridian should be selected which is now in most general use. This additional consideration of economy would limit our choice to the meridian of Greenwich, for it may fairly be stated upon the authority of the distinguished Delegate from Canada that more than 70 per cent. of all the shipping of the world uses this meridian for purposes of navigation.

The charts constructed upon this meridian cover the whole navigable globe. The cost of the plates from which these charts are printed is probably 75 per cent. of the cost of all plates in the world for printing mariners' charts, and is probably not less than ten millions of dollars. As a matter of economy, then, to the world at large, it would be better to permit those plates to remain unchanged

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which are engraved for the meridian of Greenwich and to make the necessary changes in all plates engraved for other meridians.

A very natural pride has led the great nations to establish by law their own prime meridian within their own borders, and into this error the United States was led about 35 years ago.

Should any of us now hesitate in the adoption of a particular meridian, or should any nation covet the honor of having the selected meridian within its own borders, it is to be remembered that when the prime meridian is once adopted by all it loses its specific name and nationality, and becomes simply the Prime Meridian.

Mr. RUTHERFURD, Delegate of the United States, stated that he did not propose to take up much of the time of the Conference; that he had listened with great pleasure to the exhaustive speech of his colleague, Commander SAMPSON, but that he wished to say a few words about the conditions of permanence in the prime meridian to which allusion had just been made. He said that he would call attention to the fact that the observatory at Paris stands within the heart of a large and populous city; that it has already been thought by many of the principal French astronomers that it should no longer remain there; that it has been, interfered with by the tremors of the earth and emanations in the air, which prevent it from fulfilling its usefulness; that for several years past strenuous efforts have been made to remove the observatory from Paris to some other place where it may be free to follow out its course of usefulness, and that the only thing which keeps it there is the remembrance of the honorable career of that observatory in times past. He added that he was sure that there was no one here who failed to recognize its claims to distinction; that there was no one here acquainted with the past history of astronomy but looks with pride upon the achievements of the human intellect effected there. At the same time, however, if a change is to be made, if sentiment should give way to practical reason, a locality, no doubt, will be found which may be calculated to fulfil the requirements of a prime meridian better than that one.

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As to the fitness of Greenwich, he said that the observatory was placed in the middle of a large park under the control of the Government, so that no nuisance can come near it without their consent, and that it was in a position which speaks for itself; that he would only add one word more in regard to this matter, and that is, that the adoption of the meridian of Greenwich as the prime meridian has not been sought after by Great Britain; that it was not her proposition, but that she consented to it after it had been proposed by other portions of the civilized world.

Mr. JANSSEN, Delegate of France, said: We do not put forward the meridian of the observatory of Paris as that to be chosen for the prime meridian; but if it were chosen, and we wished to compare it with that of Greenwich as to the accuracy with which it is actually connected with the other observatories of Europe, it would not lose by the comparison. The latest observations of the differences of longitude made by electricity by the Bureau of Longitudes of France and our officers have given very remarkable results of great accuracy. It is well known that what is important for a starting point in reckoning longitude is, above all things, that it should be accurately connected with points whose positions have been precisely fixed, such as the great observatories. There is, therefore, a slight confusion on the part of my eminent colleague, namely, that of not distinguishing between the conditions which require the exact connection of the starting point of longitudes with observatories, and the merits of the position of such a point in an astronomical aspect, which is here a matter of secondary importance.

Mr. LEFAIVRE, Delegate of France, said that he did not not know if his observation was well founded, but it seemed to him that what the Delegates of France had proposed had not been contested, but that the arguments used had rather been those in favor of the adoption of the meridian of Greenwich.

Mr. RUTHERFURD, Delegate of the United States, said that the observations which he had made were merely to be regarded as a negative of the proposition made by the Delegates of France, and not as a statement of the arguments in favor of the adoption of Greenwich.

The PRESIDENT said that the remarks of the Delegate of the United States were not out of order, inasmuch as they were intended to combat the proposition brought forward by the Delegate of France.

Mr. JANSSEN, Delegate of France, then spoke as follows:

GENTLEMEN: At the last session, when a proposition was made by my eminent colleague and friend, Mr. RUTHERFURD, to discuss and vote upon the adoption of the meridian of Greenwich as the common prime meridian, I thought it necessary to say that the proposal appeared to me prematurely made, and that we could not agree to the discussion proceeding in that manner. Mr. RUTHERFURD has informed me that he would withdraw his proposition for the present, in order to permit me to direct the discussion, in the first place, to the principle which should direct the choice of a common prime meridian. I here take the opportunity of thanking Mr. RUTHERFURD for his courtesy, and I no longer object to proceeding with the debate.

What we ask is, that after the general declaration of the second session as to the utility of a common prime meridian, the Congress should discuss the question of the principle which should guide the choice of that meridian.

Being charged to maintain before you, gentlemen, the principle of the neutrality of the prime meridian, it is evident that if that principle was rejected by the Congress it would be useless for us to take part in the further discussion of the choice of the meridian to be adopted as the point of departure in reckoning longitude.

We think, gentlemen, that if this question of the unification of longitude is again taken up after so many unsuccessful attempts to settle it as are recorded in history, there will be no chance of its final solution unless it be treated upon an exclusively geographical basis, and that at any cost all national competition should be set aside. We do not advocate any particular meridian. We put ourselves completely aside in the debate, and thus place ourselves in a position of far greater freedom for expressing our opinion, and discussing the question exclusively in view of the interests affected by the proposed reform.

The history of geography shows us a great number of attempts to establish a uniformity of longitude, and when we look for the reasons which have caused those attempts (many of which were very happily conceived) to fail, we are struck with the fact that it appears due to two principal causes—one of a scientific and the other of a moral nature. The scientific cause was the incapacity of the ancients to determine exactly the relative positions of different points on the globe, especially if it was a question of an island far from a continent, and which consequently could not be connected with that continent by itinerary measurements. For example, the first meridian of Marinus of Tyre and Ptolemy, placed on the Fortunate Isles, in spite of its being so well chosen at

the western extremity of the then known world, could not continue to be used on account of the uncertainty of the point of departure. That much to be regretted obstacle caused the method to be changed. It became necessary to fall back on the continent. But then, in place of a single common origin of longitude indicated by nature, the first meridians were fixed at capitals of countries, at remarkable places, at observatories. The second cause to which I just now alluded, the cause of a moral nature—national pride—has led to the multiplication of geographical starting-points where the nature of things would have required, on the contrary, their reduction to a single one.

In the seventeenth century, Cardinal Richelieu, in view of this confusion, desired to take up again the conception of Marinus of Tyre, and assembled at Paris French and foreign men of science, and the famous meridian of the Island of Ferro was the result of their discussions.

Here, gentlemen, we find a lesson which should not be lost sight of. This meridian of Ferro, which at first had the purely geographical and neutral character which could alone establish and maintain it as an international first meridian, was deprived of its original characteristic by the geographer Delisle, who, to simplify the figures, placed it at 20 degrees in round numbers west of Paris. This unfortunate simplification abandoned entirely the principle of impersonality. It was no longer then an independent meridian; it was the meridian of Paris disguised. The consequences were soon felt. The meridian of Ferro, which has subsequently been considered as a purely French meridian, aroused national susceptibilities, and thus lost the future which was certainly in store for it if it had remained as at first defined. This was a real misfortune for geography. Our maps, while being perfected, would have preserved a common unit of origin, which, on the contrary, has altered more and more.

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If, as soon as astronomical methods had been far enough advanced to permit the establishment of relative positions with that moderate accuracy which is sufficient for ordinary geography, (and that could have been done at the end of the 17th century,) we had again taken up the just and geographical conception of Marinus of Tyre, the reform would have been accomplished two centuries sooner, and to-day we should have been in the full enjoyment of it. But the fault was committed of losing sight of the essential principles of the question, and the establishment of numerous observatories greatly contributed to this. Furnishing naturally very accurate relative positions, each one of these establishments was chosen by the nation to which it belonged as a point of departure for longitude, so that the intervention of astronomy in these questions of a geographical nature, an intervention which, if properly understood, should have been so useful, led us further away from the object to be attained.

In fact, gentlemen, the study of these questions tends to show that there is an essential distinction between meridians of a geographical or hydrographical nature and meridians of observatories. The meridians of observatories should be considered essentially national. Their function is to permit observatories to connect themselves one with another for the unification of the observations made at them. They serve also as bases for geodetic and topographical operations carried on around them. But their function is of a very special kind, and should be generally limited to the country to which they belong.

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On the contrary, initial meridians for geography need not be fixed with quite such a high degree of accuracy as is required by astronomy; but, in compensation, their operation must be far reaching, and while it is useful to increase as much as possible the number of meridians of observatories, it is necessary to reduce as much as we can the starting points for longitudes in geography.

Further, it may be said that as the position of an observatory should be chosen with reference to astronomical considerations, so an initial meridian in geography should only be fixed for geographical reasons.

Gentlemen, have these two very different functions been always well understood, and has this necessary distinction been preserved? In no wise. As observatories, on account of the great accuracy of their operations, furnish admirable points of reference, each nation which was in a condition to do it connected with its principal observatory not only the geodetic or topographical work which was done at home—a very natural thing—but also general geographical or hydrographical work which was executed abroad, a practice which contained the germ of all the difficulties with which we are troubled to-day. Thus, as maps accumulated, the need of uniformity, especially in those that referred to general geography, was felt more and more.

This explains why this question of a single meridian as a starting point has been so often raised of late.

Among the assemblies which have occupied themselves with this question, the one which principally calls for our attention is that which was held at Rome last year; indeed, for many of our colleagues the conclusions adopted by the Congress of Rome settle the whole matter. These conclusions must, therefore, receive our special attention.

In reading the reports of the discussions of that Congress, I was struck with the fact that in an assembly of so many learned men and eminent theorists it was the practical side of the question that was chiefly considered, and which finally determined the character of the resolutions adopted.

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Thus, instead of laying down the great principle that the meridian to be offered to the world as the starting-point for all terrestrial longitudes should, have above all things, an essentially geographical and impersonal character, the question was simply asked, which one of the meridians in use among the different observatories has (if I may be allowed to use the expression) the largest number of clients? In a matter which interests geography much more than hydrography, as most sailors acknowledge, because there exist really but two initial hydrographic meridians, Greenwich and Paris, a prime meridian has been taken, the reign (practical influence) of which is principally over the sea; and this meridian, instead of being chosen with reference to the configuration of the continents, is borrowed from an observatory; that is to say, that it is placed on the globe in a haphazard manner, and is very inconveniently situated for the function that it is to perform. Finally, instead of profiting by the lessons of the past, national rivalries are introduced in a question that should rally the good-will of all.

Well, gentlemen, I say that considerations of economy and of established custom should not make us lose sight of the principles which must be paramount in this question, and which alone can lead to the universal acceptance and permanence of its settlement. Furthermore, gentlemen, these motives of economy and of established custom, which have been appealed to as a decisive argument, exist, it is true, for the majority in behalf of which they have been put forward, but exist for them only, and leave to us the whole burden of change in customs, publications, and material.

Since the report considers us of so little weight in the scales, allow me, gentlemen, to recall briefly the past and the present of our hydrography, and for that purpose I can do no better than to quote from a work that has been communicated to me, and which emanates from one of our most learned hydrographers. "France," he says, "created more than two centuries ago the most ancient nautical

ephemerides in existence. She was the first to conceive and execute the great geodetic operations which had for their object the construction of civil and military maps and the measurement of arcs of the meridian in Europe, America, and Africa. All these operations were and are based on the Paris meridian. Nearly all the astronomical tables used at the present time by the astronomers and the navies of the whole world are French, and calculated for the Paris meridian. As to what most particularly concerns shipping, the accurate methods now used by all nations for hydrographic surveys are of French origin, and our charts, all reckoned from the meridian of Paris, bear such names as those of Bougainville, La Pérouse, Fleurieu, Borda, d'Entrecasteaux, Beautemps, Beaupré, Duperrey, Dumont d'Urville, Daussy, to quote only a few among those who are not living.

"Our actual hydrographic collections amount to more than 4,000 charts. By striking off those which the progress of explorations have rendered useless, there still remain about 2,600 charts in use. Of this number more than half represent original French surveys, a large part of which foreign nations have reproduced. Amongst the remainder, the general charts are the result of discussions undertaken in the Bureau of the Marine, by utilizing all known documents, French as well as foreign, and there are relatively few which are mere translations of foreign works. Our surveys are not confined to the coasts of France and of its colonies; there is scarcely a region of the globe for which we do not possess original work—Newfoundland, the coasts of Guiana, of Brazil, and of La Plata, Madagascar, numerous points of Japan and of China, 187 original charts relative to the Pacific. We must not omit the excellent work of our hydrographic engineers on the west coast of Italy, which was honored by the international jury with the great medal of honor at the Universal Exhibition of 1867. The exclusive use of the Paris meridian by our sailors is justified by reference to a past of two centuries, which we have thus briefly recalled.

"If another initial meridian had to be adopted, it would be necessary to change the graduation of our 2,600 hydrographic plates; it would be necessary to do the same thing for our nautical instructions, (sailing directions,) which exceed 600 in number. The change would also necessarily involve a corresponding change in the *Connaissance des Temps*."

These are titles to consideration of some importance. Well, if under these circumstances the projected reform, instead of being directed by the higher principles which ought to govern the subject, should take solely for its base the respect due to the established customs of the largest number and the absence on their part of all sacrifice, reserving to us alone the burden of the change and the abandonment of a valued and glorious past, are we not justified in saying that a proposition thus made would not be acceptable?

When France, at the end of the last century, instituted the metre, did she proceed thus? Did she, as a measure of economy and in order to change nothing in her customs, propose to the world the "Pied de Roi" as a unit of measure? You know the facts. The truth is, everything with us was overthrown—both the established methods and instruments for measurement; and the measure adopted being proportioned only to the dimensions of the earth, is so entirely detached from everything French that in future centuries the traveller who may search the ruins of our cities may inquire what people invented the metrical measure that chance may bring under his eyes.

Permit me to say that it is thus a reform should be made and becomes acceptable. It is by setting the example of self-sacrifice; it is by complete self-effacement in any undertaking, that opposition is disarmed and true love of progress is proved.

I now hasten to say that I am persuaded that the proposition voted for at Rome was neither made nor suggested by England, but I doubt whether it would render a true service to the English nation if it be agreed to. An immense majority of the navies of the world navigate with English charts; that is true, and it is a practical compliment to the great maritime activity of that nation. When this freely admitted supremacy shall be transformed into an official and compulsory supremacy, it will suffer the vicissitudes of all human power, and that institution, (the common meridian,) which by its nature is of a purely scientific nature, and to which we would assure a long and certain future, will become the object of burning competition and jealousy among nations.

All this shows, gentlemen, how much wiser it would be to take for the origin of terrestrial longitude a point chosen from geographical considerations only. Upon the globe, nature has so sharply separated the continent on which the great American nation has arisen, that there are only two solutions possible from a geographical point of view, both of them very natural.

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The first solution would consist in returning, with some small modification, to the solution of the ancients, by placing our meridian near the Azores; the second by throwing it back to that immense expanse of water which separates America from Asia, where on its northern shores the New World abuts on the old.

These two solutions may be discussed; this has been often done, and again quite recently, by one of our ablest geologists, M. de Chancourtois.

Each of these meridians combine the fundamental conditions which geography demands and upon which there has always been an agreement when national meridians are set aside from the discussion. As to the determination of the position of the point which may be adopted, the present excellent astronomical methods will give it with a degree of exactness as great as that which geography requires.

But what is the necessity for a special and costly determination of the longitude of a point which can be fixed arbitrarily, provided this be done within certain limits, as for instance by satisfying the conditions of passing through a strait or an island. We may be content with fixing the position of the point adopted in an approximate manner. The position thus obtained would be connected with certain of the great observatories selected for the purpose from their being accurately connected one with another, and the relative positions thus ascertained would supply the definition of the first meridian. As to any material mark on the globe, if one be desired, though it is in no manner necessary, it would be established in conformity with this definition, and its position should be changed until it exactly complied with it.

As to the question of the changes to be introduced in existing maps and charts which, by our proposition, would be imposed upon everybody, they could be very much reduced, especially if it were agreed—which would be sufficient at first—to draw upon existing charts only a subsidiary additional scale of graduation which would permit immediate use of the international meridian. Later, and as new charts were engraved, a more complete scale of graduation would be given; but I think that it would always be desirable to preserve in the manner now done in many atlases both systems of reckoning longitude—the national and international. If it be necessary at the present time to facilitate the external relations of all nations, it is also well to preserve among them all manifestations of personal life, and to respect the symbols which represent their traditions and past history.

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Gentlemen, I do not propose to dwell upon the details of the establishment of such a meridian. We have only to advocate before you the principle of its acceptance.

If this principle be admitted by the Congress, we are instructed to say that you will find in it a ground for agreement with France.

Without doubt, on account of our long and glorious past, of our great publications, of our important hydrographic works, a change of meridian would cause us heavy sacrifices. Nevertheless, if we are approached with offers of self-sacrifice, and thus receive proofs of a sincere desire for the general good, France has given sufficient proofs of her love of progress to make her co-operation certain.

But we shall have to regret that we are not able to join a combination which to protect the interests of one portion of the contracting parties would sacrifice the more weighty scientific character of the meridian to be adopted, a character which in our eyes is indispensable to justify its imposition upon all, and to assure it permanent success.

Prof. J. C. ADAMS, Delegate of Great Britain, stated that if he were allowed to offer a few observations upon the eloquent address made by his colleague, the representative of France, Mr. JANSSEN, he would remark that, so far as he could follow that discourse, it seemed to him to turn almost entirely on sentimental considerations; that it appeared to him that the Delegate of France had overlooked one great point which was correctly laid down by the President in his opening address, viz., that one of the main objects to be kept in view in the deliberations of this Conference would be, how best to secure the aggregate convenience of the world at large—how we should choose a prime meridian which would cause the least inconvenience by the change that would take place. Of course, any change would necessarily be accompanied by a certain amount of inconvenience, but our object, as he understood it, was to take care that that inconvenience should be as small in its aggregate amount as possible.

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He stated that if that were taken as the ground of consideration by this Conference, it appeared to him that the question was narrowed to one of fact rather than to be one of sentiment, which latter would admit of no solution whatever; for it was quite clear that if all the Delegates here present were guided by merely sentimental considerations, or by considerations of *amour propre*, the Conference would never arrive at any conclusion, because each nation would put its own interests on a level with those of every other.

He added that if the Conference should be able to agree in the opinion that the adoption of one meridian (for his part he did not undertake to say what meridian) would be accompanied by a greater amount of convenience in the aggregate than the adoption of any other, he thought that this should be the predominant consideration in guiding the decision of this Conference, on the question referred to them, and it appeared to him that this is a consideration which the Delegate of France has not put before this Conference, at least not in a prominent way. It is clear that the inconvenience caused to any one nation by the adoption of a new neutral meridian would not be lessened by the fact that all other nations would suffer the same inconvenience.

With respect to the question of a neutral meridian, Professor ADAMS wished to call the attention of the Congress to the fact that the Delegates here present are not a collection of representatives of belligerents; that they are all neutral as men should be in a matter purely scientific, or in any other matter which affects the convenience of the world at large, and that this Conference is not met here

at the end of a war to see how territory should be divided, but in a friendly way, representing friendly nations.

He stated that he hoped the Delegates would be guided in their decision by the main consideration, which was, What will tend to the greatest practical convenience of the world? That he need not address a word to the other part of the argument which he thought at first of commenting upon a little, for the Delegate of the United States, Commander SAMPSON, who spoke first, had put his views so clearly before the Conference that he (Professor ADAMS) would not detain it longer.

He would add, however, that if the Conference is to take a neutral meridian they must either erect an observatory on the point selected, which might be very inconvenient if they should choose such a point as is alluded to by the Delegate of France, or if some such place was not selected, we should merely have a zero of longitude by a legal fiction, and that would not be a real zero at all; that they would have to select their zero with reference to a known observatory, and that, for instance, supposing they took a point for zero twenty degrees west of Paris, of course that would be really adopting Paris as the prime meridian; that it would not be so nominally, but in reality it would be, and he thought that we now-a-days should get rid of legal fictions as much as possible, and call things by their right names.

Mr. JANSSEN, Delegate of France, said:

My eminent colleague, whose presence is an honor to this Congress, Professor ADAMS, thinks that I overlook too much the practical side of the question; namely, how a prime meridian can be established so as to cause the least inconvenience. He says that I pay too much attention to what he calls a question of sentiment, and he concludes by expressing the hope that all nations will lay aside their national pride and only be guided by this consideration: What meridian offers the greatest practical advantages? My reply is that I intend no more than Professor ADAMS to place the question upon the ground of national pride; but it is one thing to speak in the name of national pride and another to foresee that this sentiment common to all men, may show itself, and that we should avoid conclusions likely to arouse it, or we may compromise our success. That is all our argument; and the history of the great nation to which Professor ADAMS belongs furnishes us with examples of considerable significance, for the French meridian of Ferro was never adopted by the English, notwithstanding its happy geographical situation, and we all still awaiting the honor of seeing the adoption of the metrical system for common use in England.

But let us put aside these questions which I would not have been the first to touch upon, and place ourselves upon the true ground of the importance of the proposed reform, which is the only one worthy of ourselves or of this discussion. We do not refuse to enter into an agreement on account of a mere question, of national pride, and the statement of the changes and expenses to which we should have to submit in order to accomplish the agreement is a sufficient proof of this.

But we consider that a reform which consists in giving to a geographical question one of the worst solutions possible, simply on the ground of practical convenience, that is to say, the advantage to yourselves and those you represent, of having nothing to change, either in your maps, customs, or traditions—such a solution, I say, can have no future before it, and we refuse to take part in it.

Prof. ABBE, Delegate of the United States, stated that the Delegate of France, Mr. JANSSEN, had made a very important proposition to the Conference: That the meridian adopted should be a neutral one. He said that he had endeavored to determine what a neutral meridian is. On what principle shall the

Conference fix upon a neutral meridian, and what is a neutral meridian? Shall it be historical, geographical, scientific, or arithmetical? In what way shall it be fixed upon? He looked back a little into the history of an important system adopted some years ago. France determined to give us a neutral system of weights and measures, and the world now thanks her for it. She determined that the base of this neutral system should be the ten-millionth part of a quadrant of the meridian. She fixed it by measurement, and to-day we use the metre as the standard in all important scientific work; but is that metre part of a neutral system? Is our metric system neutral? It was intended to be, but it is not; we are using a French system. Had the English, or the Germans, or the Americans taken the ten-millionth part of the quadrant of the meridian, they would have arrived at a slightly different measure, and there would have been an English, a German, and an American measure. We are using the French metric system. It was intended to be a neutral system, but it is a French system. We adopt it because it deserves our admiration, but it is not a neutral system. The various nations of the world might meet and agree upon some slight modification of this metric system which would agree with the results of all scientific investigations, and thus make it international instead of French; but we do not care to do that, and are willing to adopt one system, taking the standard of Paris as our standard. How shall we determine a neutral system of longitude? The expression "neutral system of longitude" is a myth, a fancy, a piece of poetry, unless you can tell precisely how to do it. He would vote for a neutral system if the French representatives can tell the Conference clearly how to decide that it is neutral, and satisfy them that it is not national in any way.

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Mr. JANSSEN, Delegate of France, said:

I perfectly understand the objection of my honorable colleague, Prof. ABBE. He asks what is a neutral meridian, and adds that the metre itself does not appear to him to be a neutral measure, but to be a French measure. He relies upon the consideration that if the English, the Americans, and Germans, in adopting a definition of the metre, had measured it for themselves, they would have arrived each at a slightly different result, which would have given us an English, American, and German metre; nevertheless, he adds, we use the French metre, because we find it so admirable.

I would answer, first, that the metre, as far as the measure is derived from the dimensions of the earth, is not French, and it was precisely to take away this character of nationality that those who fixed on the metre sought to establish it on the dimensions of the earth itself. What is French is the particular metre of our national archives, which exhibits a very slight difference from that which our actual geodesy would have given us. Also, I think that if, at the time of the adoption of the Convention du Mètre, in which the nations of Europe participated, we had slightly changed the length of our standard to make it agree with the result of actual geodetic measurements, we should have done an excellent thing in depriving this measure of any shadow of nationality. I agree with my honorable colleague that if a few slight changes adopted by common accord could perfect the metrical system, we French ought to have no motive for opposing it. We have the honor of having invented a system of measures which, being based upon considerations of a purely scientific nature, has been accepted by all. Therefore if it can be said with truth that the metre of the Archives of Paris is French, (not intentionally, but because it bears the mark of an error of French origin,) it is an international metre, by the same title that the discovery of the satellites of Mars made by my friend, Prof. Asaph Hall, whom I have the pleasure of seeing here, is scientific and of a universal nature. The metre—equal to the ten-millionth part of the distance from the equator to the pole—is

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no more French than that distance itself, and, nevertheless, if the Americans, English, or Germans had measured it, they would each have arrived at a slightly different metre.

Now, my honorable colleague adds that a neutral meridian appears to him a myth, a fancy, a piece of poetry, so long as we have not exactly settled the method of determining it. I shall disregard the expressions which my honorable colleague has thus introduced into the discussion, because this discussion should be serious. It is plain that Prof. ABBE did not thoroughly apprehend the explanations which I gave of the proper methods of fixing the initial meridian, and of the conditions which make a meridian neutral; but I return to them, since I am invited to do so. Our meridian will be neutral if, in place of taking one of those which are fixed by the existing great observatories, to which, consequently, the name of a nation is attached, and which by long usage is identified with that nation, we choose a meridian based only upon geographical considerations, and upon the uses for which we propose to adopt it.

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Do you want a striking example of what differentiates a neutral meridian from a national meridian? In order to avoid the confusion which existed in geography at the beginning of the seventeenth century, on account of the multiplicity of initial meridians then in use, a congress of learned men, assembled in Paris at the instance of Richelieu to select a new common meridian, fixed its choice on the most eastern point of the Island of Ferro. This was a purely geographical meridian, being attached to no capital, to no national observatory, and consequently neutral, or, if you please, purely geographical. Later, Le père Feuillet, sent in 1724 by the Academy of Sciences to determine the exact longitude of the initial point, having given the figure $19^{\circ} 55' 3''$ west of Paris, the geographer, Delisle, for the sake of simplicity, adopted the round number 20° ; and, as I stated a little while ago, this alteration completely changed the character of this prime meridian. It ceased to be neutral, and became merely the meridian of Paris disguised, as has been truly said, and the English, notably, never adopted it. Here is the difference, gentlemen, between a neutral meridian and a national meridian.

And, parenthetically, you see, gentlemen, how dangerous it is to awaken national susceptibilities on a subject of a purely scientific nature. Now allow me to add that, if in 1633 it was possible to find a neutral meridian, a purely geographical meridian, an independent meridian, it may easily be done in 1884 if we wish to do so; and that a point chosen on purely geographical considerations, either in Behring's Strait or in the Azores, could be much better determined now than was possible to Father Feuillet in 1724, and could take the position which the meridian of Ferro would not have lost had it not been confounded with the meridian of Paris.

Professor J. C. ADAMS, Delegate of Great Britain, stated that he merely desired to refer to one subject touched on by the Delegate of France, Mr. JANSSEN, whose opinion he thought could hardly be supported, and that was that the question of longitude was purely one of geography. He desired to controvert that, and to hold that the question of longitude was purely one of astronomical observation. The difference of longitude between two places could not be determined by geodetic observations, because to do this you must take hypothesis as to the figure of the earth, and the figure of the earth is not a simple figure. You may take as hypothesis that the figure of the earth is spheroidal, and that the ratio of the axes is exactly defined. Now, in the first place, we are not agreed as to the exact ratio of the axes, nor are we agreed as to the exact figure of the earth. If an attempt is made to measure the difference of longitude between two points on the earth's surface, especially when they are a considerable distance from each other, it is necessary to depend upon astronomical observations. In attempting to deduce the difference of longitude from geodetic

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measures, you must assume that the true figure and dimensions of the earth are known, which is far from being the case. The theory that the prime meridian is a matter purely of a geographical nature is liable to the fatal objection that the determination of the difference of longitude between one place and the other is really the determination of the difference of time of the passage of a star across the meridian of the two places concerned. That is very definite. You observe the transit of the star at one place, and you observe the transit of the star at the other place, and by means of telegraphic communications you are able to determine their difference of longitude independent of the figure of the earth. He said, in conclusion, that he thought the honorable Delegate of France was mistaken upon the main point which he had just referred to, if, indeed, he had rightly understood him.

M. JANSSEN, Delegate of France, replied as follows:

I think that M. ADAMS entirely misunderstands me. I agree with him absolutely in thinking that longitudes cannot be determined, especially of places far apart, except by astronomical methods. Geodesy can only furnish it for short distances; in such cases, it is true, it supplies it with a degree of accuracy which meridional observations cannot attain. So, if the question be to determine rigorously the difference of longitude in time between two places on the earth at considerable distances apart, it becomes one of astronomy, because here it is astronomy which gives the quickest and most accurate solution. For these reasons if, for instance, we should wish to connect a given observatory with a point situated on the other side of the ocean which had been chosen as the starting point of longitudes, it would become a question of astronomy. Astronomy here is an admirable instrument for the solution, but it should only be the instrument.

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On the contrary, the question becomes geographical, if it be that of determining where it will be most convenient to fix the origin of terrestrial longitudes. If the question be, for instance, to select one or another point, in some one or other ocean, astronomy has nothing to do with it, and when it wishes to impose upon us one of its observatories to fulfil such a function it tends to give an inaccurate solution.

At first sight it may seem that any point might become a starting point for terrestrial longitudes, but when we study the question a little more we see there may be great advantages in choosing some one point in preference to some other. Hence it is that all geographers have agreed to place initial meridians, when possible, in the oceans.

The PRESIDENT stated that, in accordance with the decision of the Conference, he had sent to the scientists named by them invitations to a seat upon this floor. The Chair sees several of these gentlemen here to-day, notably one of the most eminent astronomers of this country, to whom his countrymen are always ready to do homage, Professor Newcomb, Superintendent of the United States Nautical Almanac. If it be the pleasure of the Congress, the Chair will now request Professor Newcomb to give us his views upon the resolution now under discussion.

No objection being made to the proposition of the President, Professor NEWCOMB arose and said:

That in reference to the remarks of the distinguished Delegate of France, Professor JANSSEN, he would prefer, if the Conference would consent, to study his arguments more carefully when they should be in print.

He remarked that some points raised by that argument have been already replied to, and he wished now more particularly to request that Professor JANSSEN would define precisely what he meant by "a neutral meridian;" that he had partially answered this question in reply to Professor ABEÉ; but that there was a more fundamental point, one of practice, which must be brought in and kept in mind at every step, and which was raised by Commander SAMPSON's paper, to which he had listened with great interest. Commander SAMPSON held that it would be necessary to have a fixed observatory on the chosen prime meridian, but he (Professor NEWCOMB) did not concur in that view, but rather agreed to a limited extent with what Professor JANSSEN had said on that question.

In choosing a meridian from which to count longitude, you meet a difficult problem. You have a point on the globe defined as the first meridian. This would be taken as the initial point of departure, and you are to determine the longitude of a certain place from that point. Now, doubtless, there is no other way to do this than to have an astronomical instrument and telegraphic communication. And if they chose the Azores or Behring's Strait, in neither case could they mount a transit instrument or have a system of telegraphic communication. Nor could we make a determination of longitude from a single fixed observatory in any case.

He then stated that it was impracticable under any circumstances to have an absolutely neutral prime meridian; that the definition of the prime meridian must practically depend upon subsidiary considerations, no matter where it might be located. In the practical work of determining longitudes a connection with the prime meridian cannot be made in each case. What is really determined is the longitude from some intermediate point, generally in the same country, and in telegraphic communication with the place whose longitude we wish to know. This intermediate point would, for the time, be the practical prime meridian. But the longitude of this point itself must always be uncertain. Science is continually advancing in accuracy, and we find that we continually need to correct the longitude of our intermediate meridian, and hence of all points determined from it. How can this difficulty of constantly changing longitudes be avoided? He replied that each system of connected longitudes must rest upon its own basis. It must be referred to an assumed prime meridian, and the measurements must be made from that, even if it be found to be somewhat in error. If some such system had been adopted thirty or forty years ago, we would have avoided the confusion arising from the fact that the longitudes given on many maps do not refer at all to any absolute meridian. All that is known is that the astronomers determined the longitude of the place, and then the maps had to be corrected accordingly. The longitude of one place would be determined from Cambridge, and perhaps in the neighborhood is another place determined from the observatory at Washington. In either case we know nothing of the longitude of Cambridge or Washington which the observer assumed in his calculations.

Generally, in determining longitude, the country adopts the principal place within its confines as a subsidiary prime meridian, and the assumed longitude of this place is necessarily selected somewhat arbitrarily. The longitude, for instance, of Washington was, thirty years ago, known to be nearly 5 hours 8 minutes and 12 seconds west from Greenwich. Had we adopted this difference by law, it would have amounted to choosing for our prime meridian a point 5 hours 8 minutes and 12 seconds east of Washington, whether we happened to strike the transit instrument at Greenwich or not. This would have fixed an assumed longitude for the Cambridge observatory and for all points within our telegraphic net-work. We should have had a practical system, which might, however, require to be corrected from time to time, if some slight error were found in the assumed longitude of Washington.

In the present state of astronomical observation these little errors are of no consequence except in some very refined astronomical discussions. For all geographical and perhaps geodetical purposes the error may be regarded as zero, and it may be said, in regard to astronomical work, that it will always be independent of any meridian that might be chosen.

But even if this difficulty were avoided, he could not see how they could have any place which would come within the definition of a neutral meridian. Supposing they took the Azores, they belong to Portugal; then certainly they would have a Portuguese prime meridian, belonging to the Portuguese nation. Thus they would no longer have a neutral point, if he (Professor NEWCOMB) rightly understood the meaning of Professor JANSSEN.

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He said that the Delegate of Great Britain, Professor ADAMS, had expressed very clearly his (Professor NEWCOMB'S) ideas, and the difficulty we have in meeting the propositions of the French Delegates; that what he had said would apply very properly to any neutral meridian that might be chosen in accordance with the plans of Professor JANSSEN. Whatever that meridian might be, we must always assume for it a certain number of degrees from the capital of the country, where the place to be determined is located, and then take that imaginary meridian instead of a real point on the surface of the globe.

It is true that this is perfectly practicable, and on that theory there might not be any necessity of having an astronomical observatory. But why we should go to this trouble and expense Mr. JANSSEN did not make very clear; his considerations were purely sentimental, as was remarked by the Delegate of Great Britain, Professor ADAMS, and he (Prof. NEWCOMB) did not see what advantage would be gained by a neutral meridian in preference to one fixed by convenience.

In order that a discussion may proceed, it is necessary to agree on a given basis from which to start, and it is extremely difficult to agree upon a basis if there are considerations of sentiment introduced, because such considerations are peculiar to each person.

He therefore wished to propose this question again to the Delegate of France, namely, what advantages can we derive from fixing upon a neutral meridian?

Mr. JANSSEN, Delegate of France, said:

Professor NEWCOMB asks me to point out the advantages of a neutral meridian. These advantages are of two kinds—they are of a geographical nature and a moral nature. Let us examine the first. By placing the initial meridian between Asia and America, we get away from the centres of population, which is almost indispensable in view of the change of dates. We divide the world into two parts, the Old World and the New. The advantage of drawing the prime meridian through the ocean has always been understood, and it was precisely for this reason that Marinus of Tyre, during the first century, placed it at the Fortunate Isles, west of the African Continent. It is idle to urge the difficulty of fixing such a meridian as an objection. Astronomy is so far advanced in our day as to enable us to make this calculation with all desirable accuracy.

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As to the methods of obtaining this meridian exactly, there are several. I have already spoken of them, but I return to the subject, since more details are desired. These methods fall under two principal heads. We can, and that is the ancient idea, choose some remarkable physical point—as, for instance, the extremity of an island, a strait, the summit of a mountain—and determine approximately the distance in longitude of this point from the points of reference, which are at

present the observatories. This method, if all the precision that science can now attain is required, would be costly in certain cases. For the Azores the expense would be small, because of the proximity of the telegraphic cables; it would be much greater for Behring Straits. On the hypothesis of the employment of this method, it would evidently be necessary to place our meridian at the Azores.

According to the other method, it is not the physical point which is fixed, but simply the distance of the assumed origin from the points of comparison. For example, admit that the general definition of our prime meridian was that it should pass through the middle of Behring Straits. To obtain its theoretical definition, we should obtain a position of this point, either by summary observations of the nature of hydrographic surveys, or by the aid of existing information, and the longitude thus obtained would be connected with the observatories best connected with each other. A list of the differences of longitude would become the definition of our meridian, and not the physical point in the sea which marks the exact middle of the strait. If, now, we absolutely wished for a physical point, we have the Island of St. Lawrence, which is cut towards its eastern part by such a meridian, and we could put a point of reference there, subject to the condition that the position of this point should conform to the definition, and that it should be removed, in one direction or the other, until it did conform to it. As to the very slight errors which might still affect the relative positions of the great observatories actually connected by electricity, they do not concern geography. If I am not mistaken, the eminent Superintendent of the American Nautical Almanac acknowledges that we could thus avoid the difficulties which might result from the changes to which the perfecting of science would in the course of time give rise in the statement of longitudes.

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In this manner the expense would be nothing or small. Thus, also, the meridian would be truly neutral, both by reason of its position in the ocean between the continents, and by reason of its definition, since the zero of longitude would then be so placed as to occupy a point not identified with any nation. This illustration appears to me to answer the demands of Professor NEWCOMB. I have taken it only for that reason, for I maintain no particular method, but only the principle of neutrality.

Finally, I must return again to those sentimental reasons which my eminent and friendly opponents so often call to my attention. If I do not err, the very warmth of these interesting discussions shows me that the honor of being personally connected with a great reform touches us more than we are willing to admit, or than practical interests alone could effect.

Professor ADAMS himself supplies an illustration of this. He should remember the lively discussions of the English and French press on the occasion of the magnificent discovery of Neptune, and on the claims of the two illustrious competitors who were then the objects of universal admiration. If we go back in history, do we not see the friends of Newton and of Leibnitz equally contesting with asperity the discovery of the infinitesimal calculus. The love of glory is one of the noblest motives of men; we must bow before it, but we must also be careful not to permit it to produce bad fruits.

When our men of science sought, a hundred years ago, to determine a new measure of length, some one proposed the length of the seconds pendulum at Paris. This measure was rejected, because it introduced the idea of time in a measure of length, and also because it was peculiar to Paris, and because a measure acceptable to the whole world was desired. It is important not to introduce questions of national rivalries into a scientific reform intended to be accepted by all, and history shows us precisely on this question of prime meridians what active rivalries there are. There was a

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time when almost every nation which had a large observatory had a meridian, and that meridian was considered an object of national pride. There were the meridians of Paris, of Rome, of Florence, of London, and so on, and no nation was willing to abandon its meridian for that of another. If you please to adopt either the meridian of Greenwich, Washington, Paris, Berlin, Pulkowa, Vienna, or Rome, our reform may be accepted for the moment, especially if it offers immediate advantages in economy; but it will contain within it a vice which will prevent its becoming definitive, and we are not willing to participate in action which will not be definitive.

Whatever we may do, the common prime meridian will always be a crown to which there will be a hundred pretenders. Let us place the crown on the brow of science, and all will bow before it.

Commander SAMPSON, Delegate of the United States, said that he thought that the Delegate of France, Professor JANSSEN, had explained very fully the advantages of a neutral meridian, but he thought that he had not explained how we are to determine the neutral meridian. He added that he quite agreed with Professor ADAMS and Professor NEWCOMB, that to establish a prime meridian it is necessary to refer its position to an astronomical observatory.

He stated further that if a meridian were selected passing through the Atlantic or Pacific Ocean, it must be referred to some initial point whose longitude is known, and the consequence of that would be, it seemed to him, that the prime meridian selected would still be dependent upon some national observatory, and that to select a meridian at random without reference to any observatory would lead to the utmost confusion, and, he had no doubt, would not be entertained by any one.

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Prof. JANSSEN, Delegate of France. When my honorable colleague, Commander SAMPSON, reads the remarks which I have just made, he will see that I have very fully shown what characterizes a neutral or geographical meridian, as contradistinguished from those meridians which, passing through capitals and observatories of different countries, bear the names of nations, whilst geographical meridians bear geographical names, such as the meridian of Ferro, of the Azores, Behring's Strait, &c. Of course it would be necessary to connect the places selected with observatories, either by calculation or in some other effective manner. I said all this a few moments ago.

Mr. RUTHERFURD, Delegate of the United States, then remarked that in addition to what had been said he would merely call attention to the fact that after that neutral point had been established it would cease to be a neutral meridian; that if the Azores be chosen they belong to Portugal, and he did not know any island in the Pacific which would serve the purpose, and at the same time not be subject to this objection; that perhaps Behring's Strait, mentioned by the French Delegate, might be less objectionable than any other place. He added that it is absolutely necessary that there should be some means of determining the difference between this adopted place and the other places, or else no use could be made of it. We must know how far other places are from the prime meridian, and for that reason it is necessary that it should be on land. Now, that land must belong to some country, and after we have fixed upon it it would cease to be a neutral meridian, and it would have to be connected by telegraphic wires with all the great observatories in the world.

Prof. JANSSEN, Delegate of France. My honorable friend, Mr. RUTHERFURD, says that from the time the prime meridian was chosen it would cease to be neutral. I reply that he confounds a scientific principle with a question of property in the soil. If, for reasons of a geographical nature, we should fix upon a point in the Azores, that meridian would be neutral, because it would have been chosen

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on scientific grounds alone. The equator is neutral because geographical conditions give it that character; and, nevertheless, the countries along it belong to various nations, do they not? As to the manner of connecting the prime meridian with the system of observatories, I have already explained how this may be done in my former speech.

General STRACHEY, Delegate of England, remarked that he had rather hesitated about saying anything on the subject, after the expression of so many opinions of persons better qualified to speak than himself, but he felt that he ought to make a few remarks as to the distinction which Prof. JANSSEN had attempted to establish between astronomical and geographical longitude. It appeared to him that longitude was longitude. It would never do if, for geographic purposes, we are to have a second or third-class longitude and for astronomical purposes a first-class longitude. He said that as a geographer he repudiated any such idea. When you come to the practical application of the determination of longitude at sea for maritime purposes, it is true that a much less accurate determination suffices than would suffice for the determination of longitude for astronomical observatories; but, for all that, what is the object of a ship desiring to know what its place at sea is? Obviously to arrive at the port to which it is destined, and the object to be obtained is such a determination of the longitude as to enable that ship to arrive at its port without danger. You obtain a comparatively imperfect determination of longitude, but it is sufficiently accurate to prevent you from striking on the solid earth. But how is the longitude of the port to be determined? Certainly, as has been properly said, by astronomical observations, which can only be made with certainty on the earth. Consequently, it seemed to him that it is absolutely essential for fixing an initial meridian for the determination of longitude that it should be placed at an astronomical observatory which can be connected with other places by astronomical observations and by telegraph wires, and that the idea of fixing a neutral meridian is nothing more than the establishment of an ideal meridian really based upon some point at which there is located an observatory. This has been repeated once or twice before, and I need not enlarge upon it.

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Prof. JANSSEN, Delegate of France. My honorable colleague, General STRACHEY, thinks that longitude is longitude, and that there is not an astronomical longitude and a geographical longitude. I answer, that this is, nevertheless, what the nature of things indicates. The longitude of observatories, or rather the difference of longitude between those establishments, must be fixed with an accuracy which is never sufficiently great. In the Bureau of Longitude of France we are occupied with the differences of longitude of European observatories, and we adopt for these calculations all the latest scientific improvements, and especially the employment of electricity. Geography, especially for general purposes, does not require this great accuracy, which could not be expressed on maps. All geographers agree upon that subject. A statement of the longitude is like the statement of a weight, of a measure, or of anything, and its precision must vary according to the purpose to which it is applied. Is not a weighing necessary to determine a chemical equivalent of an entirely different kind from that of a commercial weighing? Yet it is still a weight. Is it necessary to insist on this further? It is entirely a secondary question. If General STRACHEY, whom I had the pleasure of meeting in India, demands that the prime meridian should be connected with observatories with rigorous accuracy, this can be done if it be desired; the astronomical and electrical methods at our disposal will permit of it.

Prof. ABBE, Delegate of the United States, said that he was quite interested in the determination, if possible, of what is a neutral meridian. We are precisely in the condition in which we were years ago, when the French Institute determined that the basis of the metric system should be the one ten-

millionth of the quadrant of the globe. Having settled upon that ideal basis, they spent years of labor, and finally legalized a standard metre, which is still preserved at Paris. We have now the same problem to solve. We have before us the idea of a neutral meridian, and, if it be adopted, we must see that there be embodied in the system the distance of certain other important places with reference to it. The only suggestion given as to the location of this neutral meridian is Behring's Strait. This is said to be a neutral meridian, because it lies between Russia and America; but how long will it remain so? Perhaps a year or two, or perhaps fifty years. Who knows when Russia will step over and reconquer the country on this side of Behring's Strait? Who knows when America will step over and purchase half of Siberia? At any rate, that point is not cosmopolitan; something must be found which is fixed, either within the sphere of the earth or in the stars above the earth—something that is above all human considerations—otherwise we shall fail in securing a neutral meridian.

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Commander SAMPSON, Delegate of the United States, said that he would like to ask the Delegate from France, Mr. JANSSEN, where he would place the neutral meridian.

The PRESIDENT said that the Delegate of the United States, Commander SAMPSON, puts a question which seems to be somewhat categorical.

At this point in the proceedings the PRESIDENT stated that it would be convenient if the Conference would take a short recess to enable the Secretaries, with himself, to consult upon the subject of the preparation and approval of the protocols.

A recess was thereupon taken.

After the recess, the Delegate from France, Prof. JANSSEN, presented the following resolution:

"Resolved, That the decision upon the motion of the French Delegates, in regard to the choice of a neutral meridian, be postponed to the next meeting of the Conference."

He said that as he must speak French, and as several of his colleagues could, perhaps, not entirely grasp the meaning of the discussion, he asked for the adjournment of the vote until the next meeting, so that the protocol of this meeting may be printed and distributed to the members of the Conference.

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The PRESIDENT stated that as far as he understood this resolution it merely amounted to this: that no vote shall be taken upon the original resolution of the French Delegate—namely, as to the adoption of a neutral meridian—until the next meeting of the Conference, when the protocols in both languages will have been printed and distributed.

Commander SAMPSON, Delegate of the United States, inquired whether, if this resolution were adopted, it would be necessary to vote upon the original question at the next meeting.

The PRESIDENT replied that was not necessarily the case. The Delegate of France simply desires that no vote shall be taken to-day. The original subject will come up and be open for debate at the next meeting, but it seemed to the Chair that it should be as far as possible exhausted to-day, so that the Delegates could have the whole matter before them at the next meeting.

Mr. LEFAIVRE, Delegate from France, said that the arguments already presented will require time for careful consideration. Consequently he asked for the adjournment of the vote, and he hoped that

none of his colleagues would object to it.

The PRESIDENT stated that he would venture to suggest, for the purpose of preventing delay, that so far as was possible any arguments that are to be offered should be made now, so that in the protocol of this day's proceedings, which will be of considerable length, these arguments may be incorporated.

Mr. RUSTEM EFFENDI, Delegate of Turkey, stated that it would be impossible to prepare a proper protocol of this Conference without the assistance of a French stenographer, and he therefore suggested that such a stenographer be secured as early as possible.

The PRESIDENT stated that efforts had been made to obtain a French stenographer, but without success, and that if any Delegate knows of such a stenographer and will communicate with the Chair it will be happy to take the necessary steps to secure his services.

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Count LEWENHAUPT, Delegate of Sweden, then made the following statement:

I beg to propose that the Conference adjourn at the call of the President, that the time and hour for the next meeting be communicated to the Delegates 24 hours before the meeting, and that at the same time a proof-copy of the protocols of the present meeting be forwarded.

He added that by giving the Delegates 24 hours after the protocols are printed time would be allowed them to revise the protocols and make such corrections as they thought necessary, and those corrections could be reported to the Secretaries and made in the printed text. The protocol can then be finally and definitively printed and approved at the beginning of the next meeting of the Conference.

The proposition of the Delegate of Sweden was then adopted.

The Conference then adjourned at 5 o'clock p. m., subject to the call of the President.

IV.

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SESSION OF OCTOBER 13, 1884.

The Conference met pursuant to adjournment in the Diplomatic Hall, in the State Department, at one o'clock P. M.

Present:

Austria-Hungary: Baron I. VON SCHÆFFER.

Brazil: Dr. LUIZ CRULS.

Chili: Mr. F. V. GORMAS and Mr. A. B. TUPPER.

Colombia: Commodore FRANKLIN.

Costa Rica: Mr. J. F. ECHEVERRIA.

France: Mr. A. LEFAIVRE and Mr. JANSSEN.

Germany: Baron H. VON ALVENSLEBEN and Mr. HINCKELDEYN.

Great Britain: Sir F. J. O. EVANS, Prof. J. C. ADAMS, Lieut.

General STRACHEY, and Mr. SANDFORD FLEMING.

Guatemala: Mr. MILES ROCK.

Hawaii: Hon. W. D. ALEXANDER and Hon. LUTHER AHOLO.

Italy: Count ALBERT DE FORESTA.

Japan: Professor KIKUCHI.

Liberia: Mr. WILLIAM COPPINGER.

Mexico: Mr. LEANDRO FERNANDEZ and Mr. ANGEL ANGUIANO.

Netherlands: Mr. G. DE WECKHERLIN.

Paraguay: Capt. JOHN STEWART.

Russia: Mr. C. DE STRUVE, Major-General STEBNITZKI, and
Mr. J. DE KOLOGRIVOFF.

San Domingo: Mr. M. DE J. GALVAN.

Spain: Mr. JUAN VALERA, Mr. EMILIO RUIZ DEL ARBOL, and
Mr. JUAN PASTORIN.

Sweden: Count CARL LEWENHAUPT.

Switzerland: Col. EMILE FREY.

Turkey: Mr. RUSTEM EFFENDI.

Venezuela: Dr. A. M. SOTELDO.

United States: Rear-Admiral C. R. P. RODGERS, Mr. LEWIS M.
RUTHERFURD, Mr. W. F. ALLEN, Commander W. T. SAMPSON,
and Prof. CLEVELAND ABBE.

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Absent:

Denmark: Mr. C. S. A. DE BILLE.

Salvador: Mr. A. BATRES.

The PRESIDENT. In view of the many communications addressed to the President of this Conference, having reference to the business before it, presenting statements and arguments in relation thereto, the Chair asks that a committee be appointed, to which shall be referred all such communications, and that the committee be instructed to make such report upon them as it may deem advisable.

Count LEWENHAUPT, Delegate of Sweden. I beg leave to propose to the Conference that the appointment of this committee be left to the President.

Mr. SOTELDO, Delegate of Venezuela. I second the motion of the Delegate of Sweden.

Mr. DE STRUVE, Delegate of Russia. I entertain the same opinion, and I support the motion.

The motion was then unanimously adopted.

The PRESIDENT. I will name as the members of the Committee the Delegate of Great Britain, Professor ADAMS; the Delegate of Germany, Mr. HINCKELDEYN; the Delegate of the United States, Professor ABBE; the Delegate of Japan, Mr. KIKUCHI; and the Delegate of Costa Rica, Mr. ECHEVERRIA.

PRESIDENT. After a discussion of only three hours this Conference adjourned a week ago to-day, subject to the call of its President. Owing to the want of a French stenographer to report the words that were spoken in French, there has been much delay in preparing the protocol, which has not yet been completed. Fortunately, an experienced French stenographer has been procured through the

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kind intervention of Mr. SANDFORD FLEMING, of the delegation from Great Britain, and Mr. WILLIAM SMITH, Deputy Minister of Marine for the Dominion of Canada. We may now hope to have a fairly accurate report of what is said, both in French and English, needing only slight verbal corrections, and the Chair trusts that delegates may find it convenient to make the corrections very promptly, so that the protocols may be printed and verified as speedily as possible.

Should any delegate, who has not yet spoken, desire to address the Conference upon the resolution of the Delegate from France, his remarks will now be received, and when the mover of the resolution shall close the debate, the vote will be taken, if such be the pleasure of the Conference.

Mr. SANDFORD FLEMING, Delegate of Great Britain. I have listened with great attention and deep interest to the remarks which have fallen from the several gentlemen who have spoken, and I desire your kind indulgence for a few moments while I explain the views I have formed on the motion of the distinguished Delegates from France.

I feel that the important question which this Conference has to consider must be approached in no narrow spirit. It is one which affects every nationality, and we should endeavor, in the common interest, to set aside any national or individual prejudices we possess, and view the subject as members of one community—in fact, as citizens of the world. Acting in this broad spirit, we cannot fail to arrive at conclusions which will promote the common good of mankind.

In deliberating on the important subject before us, it seems to me there are two essential points which we should constantly bear in mind.

1. We should consider what will best promote the general advantage, not now only, but for all future years, while causing at the present time as little individual and national inconvenience as possible.

2. We should, in coming to a determination on the main question for which this Conference is called, leave nothing undone to avoid offence, now or hereafter, to the sensitiveness of individual nations.

The motion is, that the initial meridian to be chosen should be selected on account of its neutrality. This undoubtedly involves the selection of an entirely new meridian, one which has never previously been used by any nation, as all initial meridians in use are more or less national, and, as such, would not be considered neutral in the sense intended by the honorable Delegates from France.

Let us suppose that this Conference adopted the motion. Let us suppose, further, that we found a meridian quite independent of and unrelated to any existing initial meridian. Would we then have accomplished the task for which we are met? I ask, would the twenty-six nations here represented accept our recommendation to adopt the neutral meridian? I greatly fear that the passing of the resolution would not in the least promote the settlement of the important question before the Conference. The world has already at least eleven different first meridians. The adoption of the new meridian contemplated by the Delegates from France would, I apprehend, simply increase the number and proportionately increase the difficulty which so many delegates from all parts of the earth are assembled here to remove.

This would be the practical effect of the passing of the resolution. If it had any effect, it would increase the difficulty, and I need not say that is not the object which the different Governments had in view when they sent delegates to this Conference. The President has well pointed out in his opening address the advantages which would be gained, and the great dangers which, at times, would be avoided by seafaring vessels having one common zero of longitude. Besides the benefits which would accrue to navigation, there are advantages of equal importance in connection with the regulation of time, to spring, I trust, from our conclusions.

It does not appear to me that the adoption of the motion would in any way advance these objects. I do not say that the principle of a neutral meridian is wrong, but to attempt to establish one would, I feel satisfied, be productive of no good result. A neutral meridian is excellent in theory, but I fear it is entirely beyond the domain of practicability. If such be the case, it becomes necessary to consider how far it would be practicable to secure the desired advantages by adopting as a zero some other meridian which, while related to some existing first meridian, would not be national in fact, and would have the same effect as a perfectly neutral meridian in allaying national susceptibilities.

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The selection of an initial meridian related to meridians now in use gives us a sufficiently wide choice. Allow me to read the following list, showing the number and the total tonnage of vessels using the several meridians named, in ascertaining their longitude.

INITIAL MERIDIANS.	SHIPS OF ALL KINDS.		PER CENT.	
	Number.	Tonnage.	Ships.	Tonnage.
Greenwich	37,663	14,600,972	65	72
Paris	5,914	1,735,083	10	8
Cadiz	2,468	666,602	5	3
Naples	2,263	715,448	4	4
Christiana	2,128	695,988	4	3
Ferro	1,497	567,682	2	3
Pulkova	987	298,641	1½	1½
Stockholm	717	154,180	1½	1
Lisbon	491	164,000	1	1
Copenhagen	435	81,888	1	½
Rio de Janeiro	253	97,040	½	½
Miscellaneous	2,881	534,569	4½	2½
Total	57,697	20,312,093	100	100

It thus appears that one of these meridians, that of Greenwich, is used by 72 per cent. of the whole floating commerce of the world, while the remaining 28 per cent. is divided among ten different initial meridians. If, then, the convenience of the greatest number alone should predominate, there can be no difficulty in a choice; but Greenwich is a national meridian, and its use as an international zero awakens national susceptibilities. It is possible, however, to a great extent, to remove this objection by taking, for a zero of longitude and time, the meridian farthest distant from Greenwich. This being on the same great circle as Greenwich, it would not require the establishment of a new observatory; its adoption would produce no change in charts or nautical tables, beyond the notation of longitude. It would possess all the advantage claimed for the Greenwich meridian in connection with navigation, and as a zero for regulating time it would be greatly to be preferred to the Greenwich meridian. This Pacific meridian being accepted as the common zero, and longitude being reckoned continuously in one direction, there would be an end to the necessity of any nation engraving on its charts the words "longitude east or west of Greenwich." The one word "longitude"

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would suffice. The zero meridian would be international and in no respect national. Even on British charts all reference to Greenwich would disappear.

This view of the question is sustained by many distinguished men. I shall only ask permission to read the opinion of Mr. Otto Struvé, Director of the Imperial Observatory at Pulkova, than whom there is no higher authority.

"The preference given to the Greenwich meridian was based, on one side, on the historical right of the Royal Observatory of England, acquired by eminent services rendered by this establishment during the course of two centuries, to mathematical geography and navigation; on the other side, considering that the great majority of charts now in use upon all the seas are made according to this meridian, and about 90 per cent. of the navigators of long standing are accustomed to take their longitude from this meridian. However, an objection against this proposition is, that the meridian of Greenwich passes through two countries of Europe, and thus the longitude would be reckoned by different signs in different portions of our own continent and also of Africa.

"Moreover, the close proximity of the meridian of Paris, to which, perhaps, some French geographers and navigators of other nations would still hold to, from custom, from a spirit of contradiction or from national rivalry, might easily cause sad disaster. To obviate these inconveniences, I have proposed to choose as prime meridian another meridian, situated at an integral number of hours east or west of Greenwich, and among the meridians meeting this condition, I have indicated, in the first place, the meridian proposed to-day by scientific Americans, as that which would combine the most favorable conditions for its adoption. Thus the meridian situated 180° from Greenwich presents the following advantages:—

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"1. It does not cross any continent but the eastern extremity of the North of Asia, inhabited by people very few in number and little civilized, called Tschouktschis.

"2. It coincides exactly with that line where, after the custom introduced by a historical succession of maritime discoveries, the navigator makes a change of one unit in the date, a difference which is made near a number of small islands in the Pacific Ocean, discovered during the voyages made to the east and west. Thus the commencement of a new date would be identical with that of the hours of cosmopolitan time.

"3. It makes no change to the great majority of navigators and hydrographers, except the very simple addition of twelve hours, or of 180° to all longitudes.

"4. It does not involve any change in the calculations of the Ephemerides most in use amongst navigators, viz., the English Nautical Almanac, except turning mid-day into midnight, and *vice versa*. In the American Nautical Almanac there would be no other change to introduce. With a cosmopolitan spirit, and in the just appreciation of a general want, the excellent Ephemerides published at Washington, record all data useful to navigators calculated from the meridian of Greenwich.

"For universal adoption, as proposed by the Canadian Institute, it recommends itself to the inhabitants of all civilized countries, by reason of the great difference in longitude, thus removing all the misunderstandings and uncertainties concerning the question, as to whether, in any case, cosmopolitan or local time was used.

"In answer to the first question offered by the Institute at Toronto, I would, therefore, recommend the Academy to pronounce without hesitation in favor of the universal adoption of the meridian situated 180° from Greenwich, as Prime Meridian of the globe."

I quote from the report of M. Otto Struvé to the Imperial Academy of Sciences of St. Petersburg, 30th Sept., 1880.

I respectfully submit, we have thus the means of solving the problem presented to us, without attempting to find such a meridian as that contemplated in the motion of the honorable delegates. Whatever its origin, the Pacific meridian referred to would soon be recognized as being as much neutral as any meridian could possibly be. If, on the other hand, we adopt the motion, I very greatly fear that the great object of this Conference will be defeated, and the settlement of a question so pregnant with advantages to the world will be indefinitely postponed.

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Dr. CRULS, Delegate of Brazil. Gentlemen. Since the opening of this discussion more authoritative voices than mine—among others that of the Honorable Mr. SANDFORD FLEMING, Delegate of Great Britain, who has just expressed his opinion upon the question—have been heard upon the important subject which we are now called upon to discuss, and of which we should endeavor to find a full and final solution. The various aspects of the projected reform—viz., the unification of longitude, which numerous international interests recommend to our care—appear to me to have been examined, and that relieves me of the task of taking up again the question in its details, and permits me to abridge very much the considerations which I think it is my duty to present in order to explain my vote. Upon to the present moment we have settled one point, gentlemen, and it is one of great importance; that is, the necessity of adopting a common prime meridian. This point has obtained the support of all the Delegates present at the Conference. This necessity being recognized, it is proper to take another step towards the solution of the problem presented to us, and to decide what that meridian shall be. It is this choice, gentlemen, which at this moment forms the subject of our discussion, and upon which we have to decide.

My honorable colleague, Mr. RUTHERFURD, the Delegate of the United States, has presented a motion proposing the adoption of the meridian of Greenwich, a motion which is again made, having been withdrawn temporarily from our discussion with the consent of its proposer. The motion which was presented at the last session, and which has formed the subject of numerous interesting discussions is that made by my honorable colleague, Mr. JANSSEN, Delegate of France, who proposes that the meridian adopted should have a neutral character, and should not cross either of the great continents of Europe or America. This proposition, gentlemen, has been strongly resisted by the Delegates of Great Britain and the United States, and firmly maintained by the Delegates of France, and the debates which followed gave us an opportunity of being present at a scientific tournament of the highest interest. The speakers whom we have had the honor of hearing seem to me to have exhausted all the arguments for and against, and at the present stage of the discussion I presume that these debates have permitted each one of us to form, with a full knowledge of the case, an opinion upon the question on which we are called to vote.

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For my part, gentlemen, I desire to state clearly the attitude that Brazil, in my opinion, must take in this Conference. That attitude is one of absolute neutrality, inasmuch as the question is whether or not to choose a national meridian which may provoke among certain nations very legitimate rivalries. From the point of view only of the interests of Brazil, the choice of one meridian rather than any other is recommended to me by no consideration. Our local charts are referred to the

nearest meridian, that of the observatory of Rio Janeiro, which is the point of departure in the geodetic or hydrographic operations in course of execution in Brazil, and which all are connected with that same meridian. The marine charts of the coast most in use are the result of the hydrographic works executed by the Commandant MOUCHEZ, now admiral and director of the observatory of Paris. As to the telegraphic determination of the longitude of the observatory of Rio, we owe it to the American Commission, directed by Commandant GREEN, of the United States Navy. Now, gentlemen, up to the day on which the Conference met for the first time, I had hoped that these discussions entered upon under the influence of a generous rivalry, and having for their only purpose the establishment of a measure, the necessity of which is strongly sought by many interests of a diverse nature, would lead to a complete and final solution of the problem. Unfortunately, and I regret to be obliged to add it, the differences of opinion which have manifested themselves in this Congress permit scarcely a hope of this result. For my part, gentlemen, I cannot lose sight of the fact that it is indispensable that the question for which this Congress is assembled should receive a complete settlement; if not, the purpose of the Congress will not be attained. Since the Delegates of France have manifested from the beginning of our discussions their opposition to the adoption of any meridian which had a national character, which has given rise to the motion presented by Mr. JANSSEN, it follows that every measure voted by the Congress tending to the adoption of a national meridian, will be, by the very fact of the abstention of France, an incomplete measure, and which will not answer the purpose sought by the Conference. I hasten to add, in order to avoid all erroneous interpretations which could be given to my words, that it would be the same, if, for instance, the meridian of Paris was proposed, and any great maritime nation, such as England, the United States, or any other, should abstain from voting for its adoption. In that case, also, the measure adopted would not be complete, and in that case, also, my line of conduct would be the same.

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To resume, I would say that the great benefits that the whole world will receive from the adoption of a common prime meridian will not be fully produced unless the measure is unanimously accepted by all the most important maritime nations. In any other event, I am, for my part, absolutely convinced that the measure adopted will be partly inefficacious, its adoption not being general, and everything will have to be done over again in the not distant future. The discussions at which we have been present abundantly prove to me that it will always be so, as long as the meridian of some great nation is proposed. In the face of this difficulty, which appears to me insurmountable, the only solution which, by its very nature, will not raise exciting questions of national pride is that of a meridian having a character of absolute neutrality. If the adoption of such a meridian was admitted in principle, I am certain that a discussion based upon pure science, and following the best conditions which it should realize, would conduct us rapidly to a practical settlement of the question.

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In such a discussion the arguments which ought to prevail should be, before everything, drawn from science, the only source of truth which alone can enlighten us, so as to permit us to form a sound judgment, and to decide solely upon considerations of a purely scientific nature.

In addition to these considerations, I am not ignorant that there are others. I refer to questions of economy of which it is necessary to take count. As to political interests, if there are any, our eminent colleagues who represent so worthily the diplomatic element in this assembly would see that they had due weight, and, thanks to this assembly of men distinguished, some in science and

others in diplomacy, there was every reason to hope that the final practical solution of the question which we are seeking would not be long in being made clear to us all by the discussions.

Moreover, this practical solution appears to me already to follow from what our honorable colleague, M. JANSSEN, has told us on that subject. The principle of the neutral meridian once adopted, there would still to be discussed the conditions which it should fulfil and the determination of its position. Two things must be considered, either the meridian will be exclusively over the ocean, and then, by its very nature, it will be neutral, or it will cut some island, and in that case nothing would prevent an international diplomatic convention making neutral the plot of land on which it was desirable to establish an observatory, which would in reality be a very small matter. Of these two solutions, both of which satisfy the conditions which the meridian ought to fulfil in its character of neutrality and by the requirements of science, I prefer the second. I wish merely to suggest by what I have said how it would be possible to arrive at a practical solution of the question, since now I am only speaking of the adoption of the principle of the neutral meridian.

I conclude, gentlemen, by declaring that I shall vote in favor of the adoption of a meridian with a character of absolute neutrality, and in doing so I hope to contribute my share to giving our resolutions such a character of independence as is necessary to make them generally acceptable in the future, and to unite in their support, at present, scientific men without distinction of nationality who are now awaiting our decision.

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Professor JANSSEN, Delegate of France. Gentlemen, I have listened with a great deal of attention to the discourse of the Delegate of England, Mr. FLEMING, and if we had not had such an exhaustive discussion last session, at which, I believe, all the reasons for and against were given, I would certainly have asked permission to answer it. But I believe that on all sides we are sufficiently enlightened on the question, and I desire above all to declare that it is not our intention of making this debate eternal. It is now for you, gentlemen, to decide. I am the more inclined to act thus, as my honorable colleague, the Delegate of Brazil, Dr. L. CRULS, who is an astronomer like myself, appears to me to have recapitulated the question with a loftiness of views, and in such happy language, that, in truth, we may take his arguments as our own. Before concluding, I wish to thank my colleagues for the kind attention that they have been good enough to accord me.

The PRESIDENT. The question recurs upon the resolution offered by the Delegates of France. The resolution is as follows:

"Resolved, That the initial meridian should have a character of absolute neutrality. It should be chosen exclusively so as to secure to science and to international commerce all possible advantages, and especially should cut no great continent—neither Europe nor America."

The PRESIDENT. Is the Conference ready for the question? No objection being made, the roll was called, with the following result:

Ayes.

Brazil,	San Domingo.
France,	

Noes.

Austria,	Germany,
Chili,	Great Britain,

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Colombia,	Guatemala,
Costa Rica,	Hawaii,
Italy,	Spain,
Japan,	Sweden,
Liberia,	Switzerland,
Mexico,	Turkey,
Netherlands,	United States,
Paraguay,	Venezuela.
Russia,	

Twenty-one noes and three ayes.

The PRESIDENT. The resolution is, therefore, lost.

Mr. RUTHERFURD, Delegate of the United States. Mr. President, in presenting again the resolution which was withdrawn by me to give place to the resolution offered by our colleagues from France, having taken the advice from several members of the Conference with whom I consulted, it was thought best to offer a system of resolutions which should be responsive to the mandate under which we act. With the view of bringing the subject to the notice of all the members of the Conference, I caused copies of the resolutions which I hold in my hand to be sent to them.

I have since heard that it has been held that these resolutions had been irregularly so communicated; that is, that the communication was made in a semi-official manner. I beg to express an entire disclaimer of anything of that sort. It was merely my individual action, and I desired to give notice of certain resolutions, with the sole view of having them fully understood before we met and to save time. I hope, therefore, that this excuse and explanation will be understood and accepted.

These resolutions are founded, as far as may be, upon those adopted at Rome. They differ from them only in two points. In the counting of longitude the Conference at Rome proposed that it should take place around the globe in one direction. This counting was to be in the direction from west to east.

Very singularly, I find in the report of the proceedings of the Roman Conference no discussion on that subject. No questions were asked, nor were any reasons given, why it should be so counted, and yet it was an entire divergence from the usage of the world at that time. The wording of the resolution of the Conference at Rome is substantially this: That the counting of longitude should take place from the meridian of Greenwich in the single direction of west to east.

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It being my desire to avail myself, as far as possible, of the work of the Conference at Rome, I consulted with my colleagues here, and found that there was a great diversity of opinion. In the first place, some said we have always counted longitude both ways, east to west and west to east. Shall we cease to do that? Those who claimed that it was a more scientific way to count all around the globe immediately differed on the direction in which the longitude should be counted. Without going into any argument as to which of these methods would be the best or most convenient, I propose, by the second resolution, that we should go on in the old way, and count longitude from the initial meridian in each direction.

One of the objects of the third resolution is to make the new universal day coincide with the civil day rather than with the astronomical day. In the Conference at Rome the universal day was made

to coincide with the astronomical day. It seems to me that the inconvenience of that system would be so great that we ought to hesitate before adopting it. For us in America, perhaps the inconvenience would not be so very great, but for such countries as France and England, and those lying about the initial meridian, the inconvenience would be very great, for the morning hours would be one day, and the afternoon hours would be another day. That seems to me to be a very great objection.

It was simply, therefore, to obviate this difficulty that this resolution was offered. I hope, notwithstanding, that some day, not far distant, all these conflicting days, the local, the universal, the nautical, and the astronomical, may start from some one point. This hope I have the greater reason to cherish since I have communicated with the distinguished gentlemen who are here present, and it was with that hope before me that I framed the resolution so that the beginning of the day should be the midnight at the initial meridian, and not the mid-day. With this explanation, I now again move the adoption of the first resolution, which is as follows:

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"Resolved, That the Conference proposes to the Governments here represented the adoption of the meridian passing through the centre of the transit instrument at the Observatory of Greenwich as the initial meridian for longitude."

The PRESIDENT. The Conference has heard the resolution. Any remarks are now in order.

Mr. SANDFORD FLEMING, Delegate of Great Britain. I think, sir, the resolution goes a little too far at a single leap. I beg leave, therefore, to move an amendment in harmony with the resolution, at the same time leaving it to be settled by a subsequent resolution, whether the zero be at Greenwich or at the other side of the globe.

"That a meridian proper, to be employed as a common zero in the reckoning of longitude and the regulation of time throughout the world, should be a great circle passing through the poles and the centre of the transit instrument at the Observatory of Greenwich."

Prof. ADAMS, Delegate of Great Britain. Mr. President, I desire merely to state, in reference to the amendment brought forward by one of our delegates, that the remaining delegates of Great Britain are by no means of the opinion expressed in that amendment, and that it is their intention, if it should come to a vote, to vote against it.

The proposition to count longitude from a point 180 degrees from the meridian of Greenwich appears to them not to be accompanied by any advantage whatever. On the contrary, it must lead to inconvenience. You do not, by adopting the meridian opposite Greenwich, get rid of the nationality of the meridian. If there is objection to the meridian of Greenwich on account of its nationality, the meridian of 180 degrees from Greenwich is subject to the same objection. The one half is just as national as the other half.

The PRESIDENT. The chair would say that no specific meridian is mentioned in the amendment.

Prof. ADAMS, Delegate of Great Britain. That is true, but, at the same time, it should be said that the meridian described is ambiguous. It is the meridian that passes through the poles and the centre of the transit instrument of the Observatory of Greenwich. That is the language of the amendment. But it is intended to apply to only one-half of the great circle passing through the poles, that is to the distant half of the meridian rather than to the nearer half. Unless it defines which half it is intended to take, the amendment is ambiguous, and it is not proper to be voted on.

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Mr. MILES ROCK, Delegate of Guatemala. Mr. President, It may be well to hear the words of the original resolution, in order that we can clearly see the relation of the amendment to that resolution.

The original resolution of the Delegate of the United States was then read.

Baron VON ALVENSLEBEN, Delegate of Germany. Mr. President, I think that in this amendment offered by the Delegate of Great Britain two questions are mixed up together. The first thing for us to do is to fix upon a prime meridian; the second thing to settle is the question whether the adoption of a universal day is desirable or not. If we adopt this amendment, these two questions are involved in one vote. Therefore, I think that they should be divided, for they are not appropriate in the form in which they are presented.

Mr. VALERA, Delegate of Spain. I ask permission to speak, in order to explain my vote. The Government which I represent here has told me to accept the Greenwich meridian as the international meridian for longitudes, but I think it my duty to say that, though the question does not arise in this debate, that Spain accepts this in the hope that England and the United States will accept on their part the metric system as she has done herself. I only wish to state this, and I have no intention of making it a subject of discussion. I shall only add that I believe Italy is similarly situated with Spain in this matter.

The PRESIDENT. The Chair would say with great deference to the distinguished Delegate from Spain that the question of weights and measures is beyond the scope of this Conference. The invitation given by the Government of the United States to the nations here represented was for a distinct and specific purpose, the selection of a prime meridian, a zero of longitude throughout the world and a standard of time-reckoning. So far as the Chair is informed, it would not be in order at this Conference to discuss a question of metric system.

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Mr. JUAN VALERA, Delegate of Spain. My only intention in making these remarks was to verify a fact. I know very well that we have not to discuss that question. Besides, the Government which I represent expresses only a hope, and I know we do not insert any hopes in our protocols; but I thought it my duty to make this declaration.

Mr. LEFAIVRE, Delegate of France. I desire to make some remarks on the question when it is put to a vote; for the time being I shall only say a few words on the remarks of my honorable colleague, the Delegate of Spain, Mr. Valera. I believe that though the question of weights and measures is not before the Conference, it is allowable for a member to state, in the name of his Government, the conditions to which his vote has been subordinated. Even though the question is not under discussion, it may appear from such an explanation that the vote is conditional, instead of being a simple affirmation. If my honorable colleague has received from his Government instructions to subordinate his vote to such or such a condition, even when the question to which it is subordinated is not submitted to the Conference, it follows from it, according to me, and everybody will admit it, that the consequences of that vote are at least conditional.

Mr. VALERA, Delegate of Spain. My Government has charged me to express here its hopes and desires, but the vote which I have given is not, in my opinion, conditional; for I have received instructions to pronounce in favor of the Greenwich meridian to measure the degrees of longitude. However, it was necessary for me to say at the same time that it was with the hope that England and the United States would adopt the French weights and measure.

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General STRACHEY, Delegate of Great Britain. While I entirely agree with the view which the Chair has taken of the question whether the adoption of metrical weights and measures is before this Conference—namely, that it is beyond our competence to discuss it—yet I am glad to have the opportunity of saying that I am authorized to state that Great Britain, after considering the opinions which were expressed at Rome, has desired that it may be allowed to join the Convention du mètre. The arrangements for that purpose, when I left my country, were either completed, or were in course of completion, so that, as a matter of fact, Great Britain henceforth will be, as regards its system of weights and measures, exactly in the same position as the United States.

In Great Britain the use of metrical weights and measures is authorized by law. Contracts can be made in which they are used, and the department which regulates the weights and measures of Great Britain is charged, consequently, with the duty of providing properly authenticated standard metric weights and measures for purposes of verification. It is quite true that the Government of England does not hold out any expectation that she will adopt the compulsory use of the metric system, either at the present time, or, so far as that goes, at any future time; but it is a well known fact—and in saying this I shall be supported, I have no doubt, by the views of the eminent scientific men of my own country who are here present—that there is a strong feeling on the part of scientific men of England that, sooner or later, she will be likely to join in the use of that system, which, no doubt, is an extremely good one, and which, so far as purely scientific purposes are concerned, is largely in use at the present time.

Mr. VALERA, Delegate of Spain. I desire to thank the honorable Delegate of England, General Strachey, for the friendly words which he has just pronounced, and to felicitate myself for having manifested the desire and hope of my Government that England should accept the weights and measures which have been accepted in Spain and in other parts of the European continent.

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Mr. LEFAIVRE, Delegate of France. Mr. Chairman, I cannot pretend to make any suggestion of any technical value on the question now before us. I only rise to add a few words to the views which have been so authoritatively expounded to you by Prof. JANSSEN, in order to explain clearly the situation of the French Government in this important discussion.

It is henceforth evident, after the instructive debate at which we have just assisted, that the meridian of Greenwich is not a scientific one, and that its adoption implies no progress for astronomy, geodesy, or navigation; that is to say, for all the branches and pursuits of human activity interested in the unification at which we aim.

Thus, science is absolutely disinterested in the selection which we are now discussing and that fact I wish to emphasize particularly, as we are about to take a vote which we can easily anticipate by the one we had a few minutes ago, in order that the opponents of the resolution may not be accused of obstructing progress and the great aims of science for private interests.

If, on the contrary, any conclusion is to be drawn from the instructive debate at which we have assisted, it is that the principal, I will say more, the only merit of the Greenwich meridian—and our colleague from Great Britain just now reminded us of it by enumerating with complacency the tonnage of British and American shipping—is that there are grouped around it, interests to be respected, I will acknowledge it willingly, by their magnitude, their energy, and their power of increasing, but entirely devoid of any claim on the impartial solicitude of science. To strengthen my assertion, gentlemen, I fall back upon the arguments brought forward by Mr. Hirsch in his

remarkable report to the Geodetic Conference at Rome, arguments that evidently carried the vote of that assembly.

The Greenwich meridian, says that report, corresponds to an empire that embraces twenty million square kilometres and a population of two hundred and fifty millions. Her merchant marine, which counts 40,000 ships of a tonnage from six to nine million tons, and crews of 370,000 men, surpasses in importance all the other marines put together. Other States, equally important by their merchant marine, especially the United States, make use of the Greenwich meridian. Well, gentlemen, if we weigh these reasons—the only ones that have been set forth, the only ones that at present militate for the Greenwich meridian—is it not evident that these are material superiorities, commercial preponderances that are going to influence your choice? Science appears here only as the humble vassal of the powers of the day to consecrate and crown their success. But, gentlemen, nothing is so transitory and fugitive as power and riches. All the great empires of the world, all financial, industrial, and commercial prosperities of the world, have given us a proof of it, each in turn.

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So long as there are not in politics or commerce any scientific means by which to fix, to enchain fortune, I see no reason to fix, to enchain, to subordinate, so to say, science to their fate.

The character of the proposed determination of the initial meridian is so evident, that the reporter of the Conference at Rome, Mr. Hirsch, admits it implicitly, for recognizing that the adoption of the meridian of Greenwich is a sacrifice for France, he asks that England should respond by a similar concession, by favoring the definitive adoption of the metric system, and by acceding to the Convention of the metre which furnishes to all States metric standards rigorously compared. Thus, Mr. Hirsch, in a spirit of justice, wished to make for each a balance of profit and loss—evident proof that the question was of a commercial, and of no scientific advantage. I am not aware, and my mission is not to discover, whether the bargain might have been accepted by France. However, it is with great pleasure that I heard our colleague from England declare that his Government was ready to join the international metric convention, but I notice, with sorrow, that our situation in this Congress is not as favorable as that of Rome, since the total abandonment of our meridian is proposed without any compensation.

At Rome the adoption of the metric system of weights and measures, of which France had the glorious initiative, was held out to us, but here we are simply invited to sacrifice traditions dear to our navy, to national science, by adding to that immolation pecuniary sacrifices.

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We are assuredly very much flattered that there should be attributed to us sufficient abnegation to elevate us to that double heroism. We wish that we were able to justify such a flattering opinion, and especially we should like to be encouraged by examples. There are at this very moment magnificent transformations to be realized for the progress of science, and of the friendly relations of nations—unification of weights and measures, adoption of a common standard of moneys, and many other innovations of a well recognized utility, infinitely more pressing and more practical than that of meridians. When the discussion of these great questions is begun, let each nation come and bring its share of sacrifices for this international progress. France, according to her usage, I may say so without vain glory as without false modesty, France will not remain behind. For the present we decline the honor of immolating ourselves alone for progress of a problematic, and eminently secondary order; and it is with perfect tranquillity of conscience that we declare that we do not concur in the adoption of the meridian of Greenwich, persuaded as we are that France does

not incur the reproach of retarding and of obstructing the march of science by abstaining from participating in this decision.

The PRESIDENT. Unless some other Delegate desires to speak, the question will be put upon the amendment of the Delegate of Great Britain, Mr. FLEMING.

The question was then put, and the amendment was lost.

The PRESIDENT. The Chair sees upon the floor to-day, as the guest of this Conference, one of the most distinguished scientists, who was invited to be present at our meetings, Sir WILLIAM THOMSON, whose name is known the world over in connection with subjects kindred to this we are now discussing. If it be the pleasure of the Conference to ask Sir WILLIAM THOMSON briefly to express his views, the Chair would be very happy to make the invitation.

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The Chair, hearing no dissent, takes pleasure in introducing Sir WILLIAM THOMSON.

Sir WILLIAM THOMSON. Mr. President and Gentlemen, I thank you for permitting me to be present on this occasion, and I thank you also for giving me the opportunity of expressing myself in reference to the subject under discussion. I only wish that the permission which you have so kindly given me may conduce to the objects of this Conference more than I can hope any words of mine can do.

The question immediately under discussion is, I understand, the proposal that the meridian passing through the centre of the instrument at the Observatory of Greenwich shall be adopted as the initial meridian of longitude, and it does seem to me that this is a practical question; that this resolution expresses a practical conclusion that it is expected by the world the present Conference may reach. It is expected that the resolutions adopted will be for the general convenience, and not for the decision of a scientific question. It is the settlement of a question which is a matter of business arrangement. The question is, what will be most convenient, on the whole, for the whole world.

It cannot be said that one meridian is more scientific than another, but it can be said that one meridian is more convenient for practical purposes than another, and I think that this may be said pre-eminently of the meridian of Greenwich.

I do most sincerely and fervently hope that the Delegates from France and from the other nations who voted for the preceding resolution will see their way to adopt the resolution that is now before the Conference. It does seem to me that it is a question of sacrifice, and I do trust that the honorable Delegate from France who spoke last, Mr. LEFAIVRE, will see that France is not being asked to make any sacrifice that it was not prepared to make.

In the admirable and interesting addresses which Mr. JANSSEN has given to this Conference, (which I had not the pleasure or satisfaction of hearing, but which I have read with great interest,) the readiness of France to make a much greater sacrifice than that which is now proposed was announced. The amount of sacrifice involved in making any change from an existing usage must always be more or less great, because it cannot be said that it is a matter of no trouble to make such a change; but what I may be allowed to suggest is that the sacrifice which France was ready to make would be very much greater than that which would be made by adopting the resolution now pending.

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If the resolution for a neutral meridian had been adopted, all nations would have to make the sacrifice necessary for a change to a meridian not actually determined, and the relations of which could not be so convenient with those meridians already adopted as are the relations between the meridians now in use with that of Greenwich. It does seem to me that if the Delegates of France could see their way to adopt this resolution, they would have no occasion whatever to regret it.

I sympathize deeply with what has been said in regard to a common metrical system. I have a very strong opinion upon this subject, which I will not express, however, if it meets any objection from the Chair; but it seems to me that England is making a sacrifice in not adopting the metrical system. The question, however, cannot be put in that way. We are not here to consider whether England would gain or lose by adopting the metrical system. That is not the way to view this question at all, because whether England should adopt the metrical system is a matter for its own convenience and use, and whether it adopts it or not, other nations are not affected by its course. It would not at all be for the benefit or the reverse of other nations.

The PRESIDENT. The Chair would be very glad to hear Sir WM. THOMSON'S views on this subject if it were before the Conference for discussion, but it is not.

Sir WILLIAM THOMSON. I beg pardon for having mentioned it.

I would repeat that the adoption of the meridian of Greenwich is one of convenience. The difference of other meridians from it is readily ascertained, and therefore it seems to me that the minimum of trouble will be entailed on the world by the general adoption of the meridian of Greenwich. This would require the minimum of change, and, furthermore, the changes which would be necessary are already wholly ascertained.

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I would inquire of the Chair whether it would be in order for me to allude to the resolutions number 2 and 3, which have been read?

The PRESIDENT. I think that we must confine ourselves to the subject immediately under discussion—the adoption of a prime meridian.

Sir WILLIAM THOMSON. Then I have only to thank you and the Delegates for allowing me to speak, and to express my very strong approbation of the resolution that has been proposed.

Sir F. J. O. EVANS, Delegate of Great Britain, then made the following remarks:

In view of the interesting information furnished to the Congress by M. JANSSEN on the hydrographic labors of France, past and present, and of the results as represented by the number of Government charts; it has appeared to myself—as having held the office of hydrographer to the Admiralty of Great Britain for many years—in which opinion I am supported by my colleagues, that I should place at the disposal of the Congress certain statistical facts bearing on the great interests of navigation and commerce, as illustrated by the number of marine charts, of sailing directions, and of nautical almanacs annually produced under the authority of the British Government, and of their distribution.

I would wish to disclaim any comparison in this respect with the labors of other countries. From personal knowledge I am aware that all nations—with only one or two exceptions—are, and

especially so in the last few years, diligent in the development of hydrography, and that a cordial interchange of the results unfettered by any conditions is steadily being pursued.

With this preface I would lay before you the following statements, observing that the shores of the whole navigable parts of the globe are embraced in the series of Admiralty charts referred to:

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The number of copper chart plates in constant use is between 2,850 and 2,900. This number keeps up steadily. About 60 new plates are added every year.

Average number of copper plates annually receiving correction amount to 2,700.

Total number of charts annually printed for the daily use of the ships of Her Majesty's fleet in commission, and for sale to the general public, has for some years ranged between 180,000 and 230,000.

The sale of Admiralty charts to the public through an authorized agent, both in London and at other commercial ports in the kingdom, has been for the last seven years as follows:

1877	.....	104,562
1878	.....	109,881
1879	.....	103,943
1880	.....	114,430
1881	.....	118,542
1882	.....	131,801
1883	.....	157,325

Of these numbers, about one-fifth have been purchased by the governments or agents of Austria, France, Germany, Italy, Russia, Turkey, and the United States. The appended list, which was furnished to me by the Admiralty Chart agent during the present year, gives the more precise particulars.

Years.	France.	Germany.	United States.	Italy.	Russia.	Turkey.	Austria.	Total.
1877	2,039	5,184	2,067	1,518	11,763	.....	.....	22,561
1878	5,741	3,381	2,641	2,645	5,651	.....	600	20,529
1879	3,340	6,425	5,185	802	9,354	.....	641	25,747
1880	5,793	5,280	1,879	797	10,145	519	376	24,788
1881	4,418	3,640	1,273	2,694	3,406	1,160	996	17,587
1882	7,454	5,656	1,716	2,569	4,245	115	1,197	22,952
1888	5,592	7,882	6,174	2,607	6,280	2,368	2,158	32,961
1884 (1st.quar.)	1,367	2,261	2,942	908	2,186	429	677	10,670
	35,741	39,679	23,867	14,440	52,930	4,591	6,544	177,795

But the chart resources of the British Admiralty, great as they are, do not suffice to meet the requirements of the smaller class ships of the mercantile marine of Great Britain. There are three commercial firms in London who publish special charts, based, however, on admiralty documents, to satisfy this demand. On inquiry I found that these firms publish 640 charts, which, from their large size, require about 930 copper plates. I am not able to furnish the number of charts sold by these firms, but it is large.

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Supplementary to the Admiralty Charts, there are 51 volumes of Sailing Directions. Several of these volumes exceed 500 pages, and have passed through several editions. Private commercial firms also, in addition to their charts, publish directions for many parts of the globe. These include regions with which the Admiralty have not yet, notwithstanding great diligence, been able to deal.

The annual sales of nautical almanacs for the past seven years have been:

1877	.....	18,439
1878	.....	16,408
1879	.....	16,290
1880	.....	14,561
1881	.....	15,870
1882	.....	15,071
1883	.....	15,535

I think, sir, that these are salient points, which will assist the Conference in coming to a clearer view of the great interest which navigation and commerce have in the charts of a particular country.

The question was then put on the adoption of the resolution offered by the Delegate of the United States, Mr. RUTHERFURD, as follows:

"That the Conference proposes to the Governments here represented the adoption of the meridian passing through the transit instrument at the Observatory of Greenwich as the initial meridian for longitude."

The roll was called, and the different States voted as follows:

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In the affirmative—

Austria,	Mexico,
Chili,	Netherlands,
Costa Rica,	Paraguay,
Columbia,	Russia,
Germany,	Spain,
Great Britain,	Sweden,
Guatemala,	Switzerland,
Hawaii,	Turkey,
Italy,	Venezuela,
Japan,	United States.
Liberia,	

In the negative—

San Domingo.

Abstaining from voting—

Brazil,	France.
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The result was then announced, as follows:

Ayes, 21; noes, 1; abstaining from voting, 2.

The PRESIDENT then announced that the resolution was passed.

Mr. DE STRUVE, Delegate of Russia. In the name of the Delegates for Russia I have now, at this point of the discussion, to say a few words.

If we had to consider the scientific side alone of the questions, which have already been discussed and resolved by the prominent scientists of the different countries at the General Conference of the International Geodetical Association at Rome, in 1883, we might as well simply adhere to the resolutions of the Roman Conference, and limit our work to the shaping of these resolutions into the form of a draft of an international convention, to be submitted for approbation to our respective Governments. But, as we have, besides, to consider the application of the intended reform to practical life, we beg to submit the following suggestions to the kind attention of the Conference.

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It is important to find for the more densely populated countries the simplest mode possible of transition from local to universal time, and *vice versa*; and we believe, therefore, that it would be convenient for the practical purposes of the question to adopt for the beginning of the universal day the midnight of Greenwich, and not the noon, as was deemed advisable by the Conference of Rome.

This modification would offer for the whole of Europe and for the greatest part of America the advantage of avoiding the double date in local and universal time during the principal business hours of the day, and would afford great facilities in the transition from local time to universal.

In adopting the universal time for the astronomical almanacs and for astronomical ephemerides, and in counting the beginning of the day from the midnight of Greenwich, there would be, it is true, a modification of the astronomical chronology, as heretofore used; but we think it easier for the astronomers to change the starting point, and to make allowance for these 12 hours of difference in their calculations, than it would be for the public and for the business men, if the date for the universal time began at noon, and not at midnight.

The Conference at Rome proposes to count the longitudes from 0° to 360° in the direction from west to east. It seems to us that this system can lead to misunderstanding in the local and universal chronology for the countries beyond the 180° east of Greenwich.

We believe that a more practical result of the reform could be easily obtained by modifying the clause IV of the resolutions of the Roman Conference, and by maintaining the system already in use for a long time, which is to count the longitudes from 0° to 180° to east and west, adopting the sign + for eastern longitudes, and the sign - for western longitudes. Thus the transition from universal to local time could be exactly expressed by the formula:

Universal time = Local time - Longitude.

The adoption of this modification would necessitate that the change of the day of the week, historically established on or about the anti-meridian of Greenwich, should henceforth take place exactly on that meridian.

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We are in favor of the adoption of the universal time (clause V of the resolutions of the Roman Conference) side by side with the local time, for international telegraphic correspondence, and for through international lines by railroads and steamers.

We fully accept the resolution of the Roman Conference concerning the introduction of the system of counting the hours of the universal day from 0 to 24; and we think it desirable that the same system should be introduced for counting the hours in ordinary life. This would greatly contribute to the disappearance of the arbitrary division of the day into two parts, a. m. and p. m., and to an easier transition from local to universal time.

We think it advisable to mark on all general maps the meridians in time as well as in degrees of longitude, which would render the reform familiar to the public, and facilitate its introduction in the education of the young.

On maritime charts the longitudes ought to be given in degrees, as these are necessary for the determination of distances in maritime miles.

The topographical maps may maintain temporarily their national meridian, in consequence of the difficulties of the modification of the co-ordinates for plates already engraved; but it would be necessary to mark on every sheet the difference between the national and the initial universal meridian in degrees of longitude.

It would be most desirable to have in all new geographical catalogues of astronomical and geodetical points the longitudes given in degrees as well as in time, and that in these new catalogues the new initial meridian be taken as the starting point for the longitudes.

The PRESIDENT. The Chair has listened with great interest and pleasure to the paper which has just been read by the Delegate of Russia, Mr. DE STRUVE, but the Chair begs to state that there is no resolution before the Conference.

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The PRESIDENT. The Chair will now direct the second resolution to be read.

The resolution was read, as follows:

"From this meridian" (*i.e.*, the meridian passing through the centre of the transit instrument at the Observatory at Greenwich) "longitude shall be counted in two directions up to 180 degrees, east longitude being plus and west longitude minus."

Mr. RUTHERFURD, Delegate of the United States. Mr. President, In submitting this resolution to the Conference, I wish to say that the remarks of the Delegate of Russia have increased my confidence in the belief of its propriety.

Mr. W. F. ALLEN, Delegate of the United States. Mr. President, the establishment of a prime meridian has, from the force of circumstances, become of practical importance to certain interests entrusted with vast responsibilities for the safety of life and property. These interests bear an important relation to the commerce of the world, and especially to the internal commerce of an extent of country embracing within its limits about sixty-five degrees of longitude. Exactness of time reckoning is an imperative necessity in the conduct of business.

On November 18, 1883, the several railway companies of the United States and the Dominion of Canada united in the adoption of the mean local times of the seventy-fifth, ninetieth, one hundred and fifth, and one hundred and twentieth meridians, west from Greenwich, as the standards of time for the operation of their roads. The system under which they have since been working has proved satisfactory. They have no desire to make any further change. A large majority of the people in the

several sections of the country through which the railways pass have either by mutual consent or special legislation adopted for their local use, for all purposes, the standards of time employed by the adjacent roads. Upon the public and working railway time-tables generally the fact has been published that the trains are run by the time of the seventy-fifth or ninetieth, etc., meridians, as the case may be.

The same standards are used by the Railway Mail Service of the United States Post-office Department, which had previously used Washington time exclusively for through schedules.

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It will at once be apparent how undesirable any action would be to the transportation interests of this country, which should so locate the prime meridian as to require these time-standard meridians to be designated by other than exact degrees of longitude. That these standard meridians should continue to be designated as even multiples of fifteen degrees from Greenwich is regarded as decidedly preferable. To change to different standards, based upon exact degrees of some other prime meridian, would require an amount of legislation very difficult to obtain.

At a convention of the managers of many important railway lines which control through their connections fully three-fourths of the entire railway system of this country, held in Philadelphia on October 9, 1884, certain action was taken, of which I have the honor to present a duly attested copy.

"At a meeting of the *General Railway Time Convention*, held in *Philadelphia, October 9th, 1884*, the following minute was unanimously adopted:

"*Whereas*, An International Conference is now in session at Washington, D. C., for the purpose of fixing upon a prime meridian and standard of time-reckoning; and

"*Whereas*, The railway companies of the United States and Canada have adopted a system of time standards based, respectively, upon the mean local times of the 75th, 90th, 105th, and 120th meridians west from Greenwich, and this system has proved so satisfactory in its working as to render any further change inexpedient and unnecessary; therefore

"*Resolved*, That it is the opinion of this Convention that the selection of any prime meridian which would change the denomination of these governing meridians from even degrees and make them fractional in their character would be disturbing in no small measure to the transportation lines of the United States and Canada.

"*Resolved*, That a duly attested copy of these resolution be presented to the Conference."

P. P. WRIGHT,
Chairman.

Attest: HENRY B. STONE,
Secretary pro tempore.

Count LEWENHAUPT, Delegate of Sweden. Mr. President, I propose as an amendment to the resolution just offered the fourth resolution adopted by the Congress at Rome:

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"It is proper to count longitude from the meridian of Greenwich in one direction from west to east."

Baron H. VON ALVENSLEBEN, Delegate of Germany. Mr. President, I beg to state that I think that this is only a question of detail; and, if the question is put to the Conference, I shall not be able to vote, and I shall abstain from voting.

The PRESIDENT. May I ask the Delegate from Germany whether his remark applies to the amendment?

Baron H. VON ALVENSLEBEN, Delegate of Germany. Yes, sir; to the amendment, and to the resolution, also.

Prof. ADAMS, Delegate of England. Mr. President, I must say that I am very much inclined to agree with the Delegate of Germany in the opinion that this is only a question of detail.

It is a mere matter of convenience whether we count longitudes in one direction only, or in two opposite directions, considering longitudes measured in one direction as positive and in the opposite direction as negative. These two methods are nominally different from each other, but in reality there is no contradiction between them.

In the mathematical reckoning of angles we may agree to begin at zero, and reckon in one direction round the entire circumference of 360 degrees, but this does not prevent a mathematician, if he finds it convenient for any purpose, from reckoning angles as positive when measured in one direction, and negative when measured in the opposite direction.

If angles be considered positive when reckoned towards the east, it is quite consistent with this usage that they should be considered negative when reckoned towards the west.

It is much more convenient to consider all angles as positive in astronomical tables, but for other purposes it may be more convenient to employ negative angles also, especially when, by so doing, you avoid the use of large numbers.

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In comparatively small countries, like Great Britain for instance, it is more convenient when giving the longitude of a place in the west of England to consider it as being a few degrees west of Greenwich, rather than 350 and some degrees to the east of that meridian.

Commander SAMPSON, Delegate of the United States. Mr. President, while I think the question of reckoning longitude is a matter of detail, I think it devolves upon us to decide it one way or the other. Navigators are more interested in the question than mathematicians, and the longitudes must be engraved upon our hydrographic charts.

Now, as the learned Delegate of Great Britain, Prof. ADAMS, who has just spoken, has stated, the principle involved is the same, whether we reckon east or west, or reckon continuously in the same direction. It seems to me, however, that when we come to consider the reckoning of longitude in connection with the adoption of a universal day, we should then make a decided choice in favor of counting longitude from zero to 360 degrees. If we adopt the resolution which my friend, the Delegate of the United States, Mr. RUTHERFURD, has offered, it will be in perfect conformity with the habits of the world. For that reason, and it is a very strong reason, I think it might be adopted; but a little consideration will show that if we reckon the longitude from zero to 360 degrees, east to west, then we will change the existing practice of reckoning longitude; but, of course, only in one hemisphere, and that will be eastward of the prime meridian; but, as we shall all remember, to the eastward of the prime meridian we have the main portions of the continents of Asia, Europe, and Africa, and in all the navigable water lying in the other hemisphere the longitude will continue to be reckoned as now. To navigators of the water lying to the eastward of the prime meridian there

will be a change in the method of counting longitude both ways, it would be necessary to adopt two different rules for converting local into universal time.

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Prof. ADAMS, Delegate of Great Britain. Oh! no; by no means.

Commander SAMPSON, Delegate of the United States. For although one rule would answer, by having regard to the algebraical sign affecting the longitude, it must be remembered that this rule is to be applied by many who are not accustomed to distinguishing east and west longitudes by a difference of sign, and who would therefore require one rule when the longitude is east and another when it is west. If, however, we adopt the method of reckoning from zero to 360 degrees, from east to west, the relation existing between the local and the universal time becomes the simplest possible. To obtain the universal date and hour, under these circumstances, it only becomes necessary to add the longitude to the local time, understanding by local time the local date as well as the local hour. I think, for this reason, it will be preferable to reckon the longitude in one direction from east to west, instead of west to east.

Sir FREDERICK EVANS, Delegate of Great Britain. I would like to present a few words on behalf of seamen. There is clearly an important change proposed by the amendment. In the resolution before us it is simply a question of the reckoning of longitude as now employed by seamen of all nations, and I think it would be well to keep that fact separate from the reckoning of time.

The PRESIDENT. The Chair begs to state that the discussion is now upon the amendment of the Delegate of Sweden, Count LEWENHAUPT, to adopt the fourth resolution of the Congress at Rome.

Sir FREDERICK EVANS, Delegate of Great Britain. Then I consider that, in the interest of seamen, it would be very undesirable to accept the amendment. We must recollect that an immense deal of the world's traffic is carried around the world entirely by sea, and that this proposed dislocation of the methods of seamen by reckoning longitude in one direction only would, to say the least, be extremely inconvenient, and it would require considerable time for them to get into the habit of doing so. I think, however, that as to the question of time, there would be no difference of opinion; doubtless, it is the easier method; but, as we have to look at the practical side of this calculation of longitude, I must certainly disagree with the amendment and vote for the original resolution.

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Mr. JUAN PASTORIN, Delegate of Spain, then presented the following amendment:

"Resolved, That the Conference proposes to the Governments here represented that longitude shall be counted from the prime meridian westward, in the direction opposite to the terrestrial rotation, and reckoned from zero degrees to 360 degrees, and from zero hours to 24 hours."

The PRESIDENT. The question before the Conference now is the amendment of the Delegate of Sweden. If the Delegate of Spain desires to offer his resolution as an amendment to the amendment already offered, the Chair will place it before the Conference.

Mr. JUAN PASTORIN, Delegate of Spain. I am in accord with the views expressed by our colleague, Commander SAMPSON, and I propose the resolution which I have just presented.

Mr. VALERA, the Delegate of Spain. I believe the amendment proposed by my colleague, Mr. PASTORIN, Delegate of Spain, does not apply to the amendment of the Delegate of Sweden, but to the original resolution. In order to avoid all ambiguity it would be much better to discuss them one

after the other. Therefore let us decide the question whether it is better to count up to 180° in each direction or up to 360° continuously. Then we can go on to something else.

The PRESIDENT. In order to meet the views expressed by Mr. VALERA, the Delegate of Spain, Mr. PASTORIN will withdraw his amendment, and the Delegate of Sweden, Count LEWENHAUPT, will propose the substance of his original resolution so modified in form that its details may be considered separately.

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Mr. JUAN PASTORIN, Delegate of Spain. In conformity with the statement of the President, I now withdraw my amendment.

Count LEWENHAUPT, Delegate of Sweden. I beg to offer the following propositions in the form of amendments to the original resolution offered by the Delegate of the United States; these may be discussed in succession:

"1. That from this prime meridian (the Greenwich meridian) longitude shall be counted in one direction."

"2. That such longitude shall be counted from west to east." Or, in place of No. 2—

"3. That such longitude shall be counted from east to west."

The PRESIDENT. The Delegates from Sweden and Spain have agreed as to the first part of the resolution, that longitude shall be counted in one direction—that is, from zero to 360 degrees. The question before the Conference is now upon the first clause of the resolution, and the other two will be subsequently discussed.

General STRACHEY, Delegate of Great Britain. I think it is impossible to proceed to a vote upon these propositions without bearing in mind what is to be decided as to the universal day. That day, as it appears to me, will have to be determined with reference to the initial meridian in such manner as to prevent, as far as possible, inconvenience from discontinuity of local time and date in passing around the world.

No matter how longitude is calculated, you must necessarily arrive at discontinuity at some point in passing around the great circle of the earth. It seems to me that the most convenient way of counting both longitude and time is that the discontinuity in both shall take place on the same point on the earth. Now, certainly, as was observed at Rome, it will be far less inconvenient if the discontinuity of date takes place on the meridian of 180 degrees from Greenwich. Then the reckoning of local time all around the world, going from west to east in the direction of the earth's rotation, will be continuous.

In any other way, as far as I can see, there will be a discontinuity at some point on the inhabited part of the earth. If the discontinuity were to take place on the meridian of Greenwich, as has been proposed by the Conference at Rome, the dates will change there during the daytime. That, as it appears to me, will be extremely inconvenient.

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In order to harmonize what I have called the discontinuity of date with the discontinuity in the reckoning of longitude, it appears to me that it will be best to reckon the longitude in both directions. There will be no discontinuity then except on the 180th meridian. It would be very inconvenient for a great part of the civilized world if the resolution which has been offered should

be adopted, if, as I presume it would do, it caused discontinuity both in longitude and local time in Europe.

After all, what are we here to endeavor to do? Notwithstanding what has been said in the other direction, for my part I must say that the great object before us is to secure the greatest convenience of the whole civilized world, and it seems to me that we should try to obtain it.

If there is no very strong reason for altering the existing system of counting longitudes, it appears to me that this is a very excellent reason in favor of maintaining it. I do not see myself that, for any practical purpose, anything would be gained by reckoning longitude from zero to 360 degrees. There may be some special scientific purposes for which it may be convenient, but the object which this resolution is intended to meet is of another character.

What we want is longitude for ordinary purposes, and on that hangs the reckoning of universal time, which, of course, should be for the general use of the whole world.

Professor ADAMS, Delegate of Great Britain. Mr. President, I doubt whether I should trouble the Conference in reference to this point. I think, however, that it is a matter of little importance whether we consider longitude as positive, when reckoned toward the east, and negative, when reckoned to the west, or go on in one direction from zero to 360 degrees; it amounts, mathematically speaking, to the same thing. We never can consider mathematical lines or angles as positive in one direction, without implying that in the opposite direction they are negative. One of these is merely the complement of the other.

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For myself, I would say that there is no use in the Conference resolving that we should count longitude only in the eastwardly direction. The Conference may say that if longitude is reckoned towards the east, it shall be considered positive, and, if reckoned towards the west, negative; and that is all we should say. I do not think it is within the competence of the Conference to say that mathematicians shall reckon longitude only in one direction. Whether you choose to reckon right through to 360 degrees or not is a matter of detail, and of no importance in a scientific point of view. You can adopt one style or the other, according to which is found the more convenient in practice.

Mr. SANDFORD FLEMING, Delegate of Great Britain. I would suggest that this matter of detail can very well be discussed and arranged by a committee, otherwise, it may take up the whole time of the Conference. I move, therefore, that a committee be appointed to take up this matter and report upon it at the next meeting.

The PRESIDENT. The Chair desires only to carry out the wish of the Conference, but it does not see clearly what we should gain by a committee. Still, if it be the desire of the Conference to order a committee, then the question will arise as to the organization of that committee, and the Chair would feel some hesitation in appointing it.

Mr. RUTHERFURD, Delegate of the United States. Mr. President, if this was a new question, in regard to which we had heard no discussion, it would be eminently proper that we should put it into the hands of a committee to formalize and thereby to shorten our deliberations; but it seems to me that the appointment of a committee now would not help us at all. When the report of that committee came in, we should have to proceed exactly as we do now.

There are only three questions before the Conference, and they come within very narrow limits. First, shall we count longitude both ways? Second, shall we count it all around the 360 degrees? Third, if so, in which direction is the counting to take place?

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These are the only three questions, and, after all, they are questions of convenience. We are just as capable of voting upon these propositions now as we should be after the appointment of a committee.

Baron VON SCHÆFFER, Delegate of Austria-Hungary. Mr. President, I move that we adjourn until tomorrow at one o'clock P.M.

The question upon the motion to adjourn was then put and adopted, and the Conference accordingly adjourned at 3.45 P.M. until Tuesday, the 14th inst., at one o'clock P.M.

V.

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SESSION OF OCTOBER 14, 1884.

The Conference met, pursuant to adjournment, in the Diplomatic Hall of the Department of State, at one o'clock p. m.

Present:

Austro-Hungary: Baron IGNATZ VON SCHÆFFER.

Brazil: Dr. LUIZ CRULS.

Chili: Mr. F. V. GORMAS and Mr. A. B. TUPPER>.

Colombia: Commodore S. R. FRANKLIN.

Costa Rica: Mr. JUAN FRANCISCO ECHEVERRIA.

France: Mr. A. LEFAIVRE, Mr. JANSSEN.

Germany: Baron H. VON ALVENSLEBEN, Mr. HINCKELDEYN.

Great Britain: Sir F. J. O. EVANS, Prof. J. O. ADAMS,
Lieut.-General STRACHEY, Mr. SANDFORD FLEMING.

Guatemala: Mr. MILES ROCK.

Hawaii: Hon. W. D. ALEXANDER, Hon. LUTHER AHOLO.

Italy: Count ALBERT DE FORESTA.

Japan: Professor KIKUCHI.

Liberia: Mr. Wm. COPPINGER.

Mexico: Mr. LEANDRO FERNANDEZ, Mr. ANGEL ANGUIANO.

Netherlands: Mr. G. DE WECKHERLIN.

Paraguay: Capt. JOHN STEWART.

Russia: Mr. C. DE STRUVE, Major-General STEBNITZKI, Mr.
KOLOGRIVOFF.

San Domingo: Mr. DE J. GALVAN.

Salvador: Mr. ATONIO BATRES.

Spain: Mr. JUAN VALERA, Mr. EMILO RUIZ DEL ARBOL, Mr.
JUAN PASTORIN.

Sweden: Count CARL LEWENHAUPT.

Switzerland: Mr. EMILE FREY.

Turkey: RUSTEM EFFENDI.

United States: Rear-Admiral C. R. P. RODGERS, Mr. LEWIS

M. RUTHERFORD, Mr. W. F. ALLEN, Commander W. T.

SAMPSON, Professor CLEVELAND ABBE.

Venezuela: Señor Dr. A. M. SOTELDO.

Absent:

Denmark: Mr. C. S. A. DE BILLE.

The PRESIDENT:

The Chair begs leave to announce that, in the regular order of business, the first matter before the Conference to-day would have been the proposition of the Delegate of Great Britain, Mr. SANDFORD FLEMING, that a committee be appointed to consider a report upon the resolution offered by him yesterday. The Chair understood, however, from Mr. FLEMING this morning that he had no desire to press that proposition, and, therefore, it may be considered as withdrawn.

The question then would be upon the amendment offered by the Delegate of Spain, Mr. JUAN PASTORIN, and if that amendment be withdrawn upon the amendment offered by the Delegate of Sweden, Count LEWENHAUPT. The Chair understands that both of those gentlemen desire to withdraw their propositions temporarily, and, in that event, the first action to be taken will be upon the resolution offered by the Delegate of the United States, Mr. RUTHERFORD.

Mr. RUSTEM EFFENDI, Delegate of Turkey. In voting yesterday in favor of the resolutions proposed by the Hon. Delegate of the United States, I wish to have it well understood that my vote does not bind my Government. I am, indeed, obliged to vote against any proposition which would tend to bind it in any way, for I desire to leave it free to act in the matter.

I engage to submit to my Government the result of our deliberations and to recommend their adoption, but that is all. In other words, I have only voted "*ad referendum*," and I ask that my statement be entered in the protocol.

The PRESIDENT. The Chair would inform the Delegate who has just spoken that the same statement was made by several delegates at a former meeting of the Conference.

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M. JANSSEN, Delegate of France. I believe that the very correct doctrine just enunciated by the Delegate of Turkey, Mr. RUSTEM EFFENDI, is the one adopted by all the members of the Congress, and that we have all voted "*ad referendum*."

The PRESIDENT. The Chair so understood the general sense of the Conference as expressed at one of our former meetings, when many of the delegates made the same declaration.

Mr. ANTONIO BATRES, Delegate of Salvador. Mr. President, I could not be present yesterday, on account of illness, and I now request permission to register my name in favor of the resolution adopting the meridian of Greenwich as the prime meridian.

The PRESIDENT. The Delegate of Salvador, Mr. BATRES, informs the Chair that he was not able to be present yesterday, on account of illness, and he desires that his name may be recorded as voting for

the meridian of Greenwich. If there be no objection to the request of the Delegate to Salvador, his vote will be so entered.

No objection being made, the President instructed the Secretary to make the proper entry in the protocol.

The PRESIDENT. The Delegate of Spain, Mr. PASTORIN, has withdrawn his amendment, and the Delegate of Sweden, Count LEWENHAUPT, has also withdrawn the amendment which he offered to the resolution of the Delegate of the United States, Mr. RUTHERFURD. The resolution originally offered will now be read.

The Secretary then read the resolution, as follows:

"Resolved, That from this meridian [i.e., the meridian of Greenwich] longitude shall be counted in two directions up to 180 degrees, east longitude being plus, and west longitude minus."

Mr. SANDFORD FLEMING, Delegate of Great Britain, representing the Dominion of Canada. I wish to offer some observations on the resolution before the Conference, but I am unable to separate the particular question from the general question. To my mind, longitude and time are so related that they are practically inseparable, and when I consider longitude, my thoughts naturally revert to time, by which it is measured. I trust, therefore, I may be permitted to extend my remarks somewhat beyond the immediate scope of the resolution. I agree with those who think that longitude should be reckoned in one direction only, and I am disposed to favor a mode of notation differing in other respects from that commonly followed.

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If a system of universal time be brought into use, advantages would result from having the system of time and the system of terrestrial longitude in complete harmony. The passage of time is continuous, and, therefore, I think longitude should be reckoned continuously. To convey my meaning fully, however, it is necessary that I should enter into explanations at some length.

Ten days back I ventured informally to place my views, with a series of recommendations on this subject, before the delegates. I hope I may now be permitted to submit them to the Conference.

The PRESIDENT. The Chair would inquire of the Conference whether the recommendations and remarks which were sent in print to the Delegates a few days ago by Mr. SANDFORD FLEMING, the Delegate of Great Britain, may be entered upon the protocol as presented to-day. Each member was, it is understood, furnished with a copy of these papers.

Mr. TUPPER, Delegate of Chili. The Delegates of Chili have not received them.

The PRESIDENT. The Chair will take care that they are sent.

No objection was made to the request of the Delegate of Great Britain, Mr. SANDFORD FLEMING, who continued as follows:

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The adoption of a Prime Meridian, common to all nations, admits of the establishment of a system of reckoning time equally satisfactory to our reason and our necessities.

At present we are without such a system. The mode of notation followed by common usage from time immemorial, whatever its applicability to limited areas, when extended to a vast continent, with a net-work of lines of railway and telegraph, has led to confusion and created many

difficulties. Further, it is insufficient for the purposes of scientific investigation, so marked a feature of modern inquiry.

Taking the globe as a whole, it is not now possible precisely to define when a year or a month or a week begins. There is no such interval of time as the commonly defined day everywhere and invariable. By our accepted definition, a day is local; it is limited to a single meridian. At some point on the earth's surface one day is always at its commencement and another always ending. Thus, while the earth makes one diurnal revolution, we have continually many days in different stages of progress on our planet.

Necessarily the hours and minutes partake of this normal irregularity. Clocks, the most perfect in mechanism, disagree if they differ in longitude. Indeed, if clocks are set to true time, as it is now designated, they must, at least in theory, vary not only in the same State or county, but to some extent in the same city.

As we contemplate the general advance in knowledge, we cannot but feel surprised that these ambiguities and anomalies should be found, especially as they have been so long known and felt. In the early conditions of the human race, when existence was free from the complications which civilization has led to; in the days when tribes followed pastoral pursuits and each community was isolated from the other; when commerce was confined to few cities, and intercommunication between distant countries rare and difficult; in those days there was no requirement for a common system of uniform time. No inconvenience was felt in each locality having its own separate and distinct reckoning. But the conditions under which we live are no longer the same. The application of science to the means of locomotion and to the instantaneous transmission of thought and speech have gradually contracted space and annihilated distance. The whole world is drawn into immediate neighborhood and near relationship, and we have now become sensible to inconveniences and to many disturbing influences in our reckoning of time utterly unknown and even unthought of a few generations back. It is also quite manifest that, as civilization advances, such evils must greatly increase rather than be lessened, and that the true remedy lies in changing our traditional usages in respect to the notation of days and hours, whatever shock it may give to old customs and the prejudices engendered by them.

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In countries of limited extent, the difficulty is easily grappled with. By general understanding, an arrangement affecting the particular community may be observed, and the false principles which have led to the differences and disagreements can be set aside. In Great Britain the time of the Observatory at Greenwich is adopted for general use. But this involves a departure from the principles by which time is locally determined, and hence, if these principles be not wrong, every clock in the United Kingdom, except those on a line due north and south from Greenwich, must of necessity be in error.

On the continent of North America efforts have recently been made to adjust the difficulty. The steps taken have been in a high degree successful in providing a remedy for the disturbing influences referred to, and, at the same time, they are in harmony with principles, the soundness of which is indisputable.

When we examine into time in the abstract, the conviction is forced upon us that it bears no resemblance to any sort of matter which comes before our senses; it is immaterial, without form, without substance, without spiritual essence. It is neither solid, liquid, nor gaseous. Yet it is capable

of measurement with the closest precision. Nevertheless, it may be doubted if anything measurable could be computed on principles more erroneous than those which now prevail with regard to it.

What course do we follow in reckoning time? Our system implies that there are innumerable conceptions designated "time." We speak of solar, astronomical, nautical, and civil time, of apparent and mean time. Moreover, we assign to every individual point around the surface of the earth separate and distinct times in equal variety. The usages inherited by us imply that there is an infinite number of times. Is not all this inconsistent with reason, and at variance with the cardinal truth, that there is one time only?

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Time may be compared to a great stream forever flowing onward. To us, nature, in its widest amplitude, is a unity. We have but one earth, but one universe, whatever its myriad component parts. That there is also but one flow of time is consistent with the plain dictates of our understanding. That there can be more than one passage of time is inconceivable.

From every consideration, it is evident that the day has arrived when our method of time-reckoning should be reformed. The conditions of modern civilization demand that a comprehensive system should be established, embodying the principle that time is one abstract conception, and that all definite portions of it should be based on, or be related to, one unit measure.

On these grounds I feel justified in respectfully asking the consideration of the Conference to the series of recommendations which I venture to submit.

The matter is undoubtedly one in which every civilized nation is interested. Indeed, it may be said that, more or less, every human being is concerned in it. The problem is of universal importance, and its solution can alone be found in the general adoption of a system grounded on principles recognized as incontrovertible.

Such principles are embodied in the recommendations which I am permitted to place before the Conference. They involve, as an essential requirement, the determination of a unit of measurement, and it is obvious that such a unit must have its origin in the motion of the heavenly bodies. No motion is more uniform than the motion of the earth on its axis. This diurnal revolution admits of the most delicate measurement, and, in all respects, is the most available for a unit measure. It furnishes a division of time definite and precise, and one which, without difficulty, can be made plain and manifest.

A revolution of the earth, denoted by the mean solar passage at the Prime or Anti-prime Meridian, will be recognizable by the whole world as a period of time common to all. By general agreement this period may be regarded as the common unit by which time may be everywhere measured for every purpose in science, in commerce, and in every-day life.

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The scheme set forth in the recommendations has in view three principal objects, viz:

1. To define and establish an universal day for securing chronological accuracy in dates common to the whole world.
2. To obtain a system of universal time on a basis acceptable to all nations, by which, everywhere, at the same time, the same instant may be observed.

3. To establish a sound and rational system of reckoning time which may eventually be adopted for civil purposes everywhere, and thus secure uniformity and accuracy throughout the globe.

But, in the inauguration of a scheme affecting so many individuals, it is desirable not to interfere with prevailing customs more than necessary. Such influences as arise from habit are powerful and cannot be ignored. The fact must be recognized that it will be difficult to change immediately the usages to which the mass of men have been accustomed. In daily life we are in the habit of eating, sleeping, and following the routine of our existence at certain periods of the day. We are familiar with the numbers of the hours by which these periods are known, and, doubtless, there will be many who will see little reason in any attempt to alter their nomenclature, especially those who take little note of cause and effect, and who, with difficulty, understand the necessity of a remedy to some marked irregularity which, however generally objectionable, does not bear heavily upon them individually.

For the present, therefore, we must adapt a new system, as best we are able, to the habits of men and women as we find them. Provision for such adaptation is made in the recommendations by which, while local reckoning would be based on the principles laid down, the hours and their numbers need not appreciably vary from those with which we are familiar. Thus, time-reckoning in all ordinary affairs in every locality may be made to harmonize with the general system.

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Standard time throughout the United States and Canada has been established in accord with this principle. Its adoption has proved the advantages which may be attained generally by the same means. On all sides these advantages have been widely appreciated, and no change intimately bearing upon common life was ever so unanimously accepted. Certainly, it is an important step towards the establishment of one system of universal time, or, as it is designated in the recommendations, Cosmic time.

The alacrity and unanimity with which the change has been accepted in North America encourages the belief that the introduction of cosmic time in every-day life is not unattainable. The intelligence of the people will not fail to discover, before long, that the adoption of correct principles of time-reckoning will in no way change or seriously affect the habits they have been accustomed to. It will certainly sweep away nothing valuable to them. The sun will rise and set to regulate their social affairs. All classes will soon learn to understand the hour of noon, whatever the number on the dial, whether six, as in Scriptural times, or twelve, or eighteen, or any other number. People will get up and retire to bed, begin and end work, take breakfast and dinner at the same periods of the day as at present, and our social habits and customs will remain without a change, depending, as now, on the daily returning phenomena of light and darkness.

The one alteration will be in the notation of the hours, so as to secure uniformity in every longitude. It is to be expected that this change will at first create some bewilderment, and that it will be somewhat difficult to be understood by the masses. The causes for such a change to many will appear insufficient or fanciful. In a few years, however, this feeling must pass away, and the advantages to be gained will become so manifest that I do not doubt so desirable a reform will eventually commend itself to general favor, and be adopted in all the affairs of life.

Be that as it may, it seems to me highly important that a comprehensive time system should be initiated to facilitate scientific observations, and definitely to establish chronological dates; that it

should be designed for general use in connection with railways and telegraphs, and for such other purposes for which it may be found convenient.

The Cosmic day set forth in the recommendations would be the date for the world recognizable by all nations. It would theoretically and practically be the mean of all local days, and the common standard to which all local reckoning would be referable.

With regard to the reckoning of longitude, I submit that longitude and time are so intimately related that they may be expressed by a common notation. Longitude is simply the angle formed by two planes passing through the earth's axis, while time is the period occupied by the earth in rotating through that angle. If we adopt the system of measuring time by the revolution of the earth from a recognized zero, one of these planes—that through the zero—may be considered fixed; the other—that through the meridian of the place—being movable, the longitudinal angle is variable. Obviously the variable angle ought to be measured from the fixed plane as zero, and as the motion of the earth by which the equivalent time of the angle is measured is continuous, the longitude ought to be reckoned continuously in one direction. The direction is determined by the notation of the hour meridians, viz., from east to west.

If longitude be so reckoned and denoted by the terms used in the notation of cosmic time, the time of day everywhere throughout the globe would invariably denote the precise longitude of the place directly under the mean sun. Conversely, at the epoch of mean solar passage at any place, the longitude being known, cosmic time would be one and the same with the longitude of the place.

The advantages of such a system of reckoning and nomenclature, as suggested in the recommendations which I now submit, will be, I think, self-evident.

RECOMMENDATIONS FOR THE REGULATION OF TIME AND THE RECKONING OF LONGITUDE

1. *That a system of universal time be established, with the view of facilitating synchronous scientific observations, for chronological reckonings, for the purpose of trade and commerce by sea and land, and for all such uses to which it is applicable.*
2. *That the system be established for the common observance of all peoples, and of such a character that it may be adopted by each separate community, as may be found expedient.*
3. *That the system be based on the principle that for all terrestrial time reckonings there be one recognized unit of measurement only, and that all measured intervals of time be directly related to the one unit measure.*
4. *That the unit measure be the period occupied by the diurnal revolution of the earth, defined by the mean solar passage at the meridian twelve hours from the Prime Meridian established through Greenwich.*
5. *That the unit measure defined as above be held to be a day absolute, and designated a Cosmic Day.*
6. *That such Cosmic Day be held as the chronological date of the earth, changing with the mean solar passage at the anti-meridian of Greenwich.*
7. *That all divisions and multiples of the Cosmic Day be known as Cosmic Time.*

8. That the Cosmic Day be divided into hours, numbered in a single series, one to twenty-four, (1 to 24,) and that the hours be subdivided, as ordinary hours, into minutes and seconds. Note.—As an alternative means of distinguishing the cosmic hours from the hours in local reckonings, they may be denoted by the letters of the alphabet, which, omitting I and V, are twenty-four in number.

9. That until Cosmic Time be admitted as the recognized means of reckoning in the ordinary affairs of life, it is advisable to assimilate the system to present usages and to provide for the easy translation of local reckonings into Cosmic Time, and vice versa; that, therefore, in theory, and as closely as possible in practice, local reckonings be based on a known interval in advance or behind Cosmic Time.

10. That the surface of the globe be divided by twenty-four equidistant hour meridians, corresponding with the hours of the Cosmic Day.

11. That, as far as practicable, the several hour meridians be taken according to the longitude of the locality, to regulate local reckonings, in a manner similar to the system in use throughout North America.

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12. That, in all cases where an hour meridian is adopted as the standard for regulating local reckonings, in a particular section or district, the civil day shall be held to commence twelve hours before and end twelve hours after the mean solar passage of such hour meridian.

13. That the civil day, based on the Prime Meridian of Greenwich, shall coincide and be one with the Cosmic Day. That civil days on meridians east of Greenwich shall be (according to the longitude) a known number of hours, or hours and minutes in advance of Cosmic Time, and to the west of Greenwich the contrary.

14. That the surface of the globe being divided by twenty-four equidistant meridians (fifteen degrees apart) corresponding with the hours of the Cosmic Day, it is advisable that longitude be reckoned according to these hour meridians.

15. That divisions of longitude less than an hour (fifteen degrees) be reckoned in minutes and seconds and parts of seconds.

16. That longitude be reckoned continuously towards the west, beginning with zero at the Anti-prime meridian, twelve hours from Greenwich.

17. That longitude, generally, be denoted by the same terms as those applied to Cosmic Time.

I submit these recommendations suggestively, and without any desire unduly to press them. I shall be content if the leading principles laid down be recognized by the Conference.

With regard to the more immediate question, I have come to the firm conviction that extreme simplicity of reckoning and corresponding benefits would result if longitude be notated in the same manner, and denoted by the same terms as universal time. If, therefore, the Conference adopts the motion of the distinguished Delegate of the United States, which, I apprehend, is designed to cause as little change as possible in the practices of sea-faring men, I trust the claims of other important interests will not be overlooked. I refer to all those interests, so deeply concerned in securing accurate time on land, and in having easy means provided for translating any one local reckoning into any other local reckoning, or into the standard universal time. In this view I trust the Conference will give some expression of opinion in favor of extending around the globe the system of hour meridians which has proved so advantageous in North America. In an educational aspect alone it seems to me important that the hour meridians, one to twenty-four, numbered from the anti-

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prime meridian continuously toward the west, should be conspicuously marked on our maps and charts.

Prof. ADAMS, Delegate of Great Britain. I wish, Mr. President, to express my entire adhesion to the proposition which has been made by the Delegate of the United States, Mr. RUTHERFURD. It seems to me to satisfy one of the principal conditions that we have had before us to guide our decision; that is, that we should pursue a course which will produce the least possible inconvenience.

Now, I think if we keep that in mind, we shall have very little difficulty in coming to the conclusion that we should reckon longitude eastward, as positive or plus, and westward as negative or minus. This mode of reckoning would be attended with the least inconvenience; in fact, it will not be attended with any inconvenience at all, because it will keep to the present mode of reckoning. For my part, I see no adequate reason for changing that. There is no scientific reason, and certainly there is no practical reason. There is no scientific reason, because, as I stated yesterday, if in mathematics you measure from the zero a distance in one direction and consider that positive, you must, by the very nature of the case, consider the distance measured in the opposite direction from the same zero as negative. One follows mathematically and necessarily from the other, and by adopting this resolution you thus include both in one general formula.

It seems to me quite as scientific, to say the least, to start from zero and go in both directions, distinguishing the longitudes by the signs plus and minus, according as the directions are taken east or west, as to reckon longitudes in one direction only from zero to 360 degrees. It is, I say, just as scientific to do this, and practically it is more convenient. Because if you go on reckoning from zero to 360 degrees continuously, you have to make a break at 360 degrees. You do not count on after you have completed one revolution, but have to drop the 360 degrees and start again at zero. But this is attended with great inconvenience, because this break in counting occurs in countries which are thickly inhabited. The longitude would be a little less than 360 degrees on one side of the prime meridian, and on the other side the longitude would be a small angle. This seems to me very inconvenient.

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On the other hand, if you count longitudes in one direction from zero to 180 degrees as positive, and in the opposite direction from zero to 180 degrees as negative, you are, no doubt, obliged to make a break in passing abruptly from plus 180 degrees to minus 180 degrees. But the break would then occur where it would cause the least inconvenience, viz., in mid-ocean, where there is very little land and very few inhabitants, and where we are accustomed to make the break now. This will require no change in the habits and customs of the people, and no inconvenience whatever would be caused by the action of the Conference if it decides on this method, which also has the minor advantage of not requiring the use of such large numbers as the other. But to adopt the reckoning of longitude from zero to 360 degrees would involve a very considerable change, and I think it may be doubted whether it would be generally accepted. Under the circumstances, I think the resolution contains the most expedient course for us to adopt. I do not object to anybody who chooses to do so reckoning on, for certain purposes, from zero to 360 degrees, but I do not think it would be well to make it compulsory.

With regard to the proposal of the Delegate of Great Britain, Mr. FLEMING, I would say that it would be attended with great inconvenience, because it departs from the usages and habits now existing. That, to my mind, is a very great and insuperable objection, and I do not see any countervailing advantage.

With regard to the subject of time that Mr. Fleming is anxious to take into consideration, I think that nothing can be simpler, if I may be allowed to deal with the question of time, than the relation between time and longitude which is proposed to be created by the resolution of Mr. RUTHERFURD.

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By that resolution the longitude indicates the relation between the local time and the universal time in the simplest possible way. What can be easier than the method involved in the resolution of Mr. Rutherford? It is this: Local time at any place is equal to universal time plus the longitude of the place, plus being understood always in a mathematical sense. The longitude is to be added to the universal time if it is positive, and subtracted if it is negative. That is very simple, the whole being involved in one general formula.

Now, I think it is perfectly impossible for Mr. Fleming to make a more simple formula than that. The formula laid down in the proceedings of the Roman Conference was far less simple, as it involved an odd twelve hours. You got the universal time equal to the local time, minus the longitude, plus twelve hours. This is far from simple. It makes the calculation more complicated, and it seems to me that for other reasons it is objectionable.

Mr. RUTHERFURD, Delegate of the United States. Mr. President, I do not propose to take up the time of the Conference in reiterating the very conclusive remarks in favor of this resolution made by the Delegate of Great Britain. I wish, however, to allude, for a moment, to another view of this question. Suppose we do not adopt this resolution. What is the course before the Conference? We shall then be called upon, no doubt, to decide that longitude shall be counted all around the world from zero to 360 degrees.

That general proposition is one which would not probably meet with violent opposition, but the next point is one that will divide us very materially, and perhaps disastrously. Which way shall we count? Shall it be towards the east or towards the west?

My conversations with the gentlemen here present have lead me to know that there is a very great difference of opinion upon this point, and I believe that if we should not adopt this resolution and should decide to count longitude from zero to 360 degrees, a preference to count it in one direction rather than the other would be established only by a very close vote, nearly annulling the whole moral influence of the Conference, and we should go back to our Governments without much, if any, authority on the point in question.

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And I doubt whether our resolutions would be accepted by these Governments if we show ourselves to be divided upon a question of so much practical importance.

It is simply a question of practice—of convenience. We all bowed to the rule of convenience in selecting the meridian of Greenwich. And why? Because seven-tenths of the civilized nations of the world use this meridian, not that it was intrinsically better than the meridian of Paris, or Washington, or Berlin, or St. Petersburg. Nobody claimed any scientific preference among these meridians. It was simply because seven-tenths of the civilized world were already using the meridian of Greenwich.

If we accept this argument in favor of the first resolution for selecting the initial meridian, why should we not be equally inclined to recognize the fact that all the civilized world count longitude in both ways? There is no difference of opinion on that point. There is no difference of usage. Shall we break that usage? Shall we introduce a new system, which may or may not be found practical or

agreeable? Shall we not rather adopt the rule of all nations, already in use among their practised astronomers and navigators, by saying continue to do as you have already done?

Sir FREDERICK EVANS, Delegate of Great Britain. Having for many years mixed among the practical seamen of more than one nation, I confess I look with some dismay on any other system for the notation of longitude being adopted than the one proposed in this resolution.

My colleague, Mr. FLEMING, made the remark that he could not disassociate longitude from time. If he had mixed with seamen, he would have found out that there is very frequently a well-defined difference between the two in their minds. Longitude with seamen means, independently of time, space, distance. It indicates so many miles run in an east or west direction. Consequently, I am not able to look upon longitude and time as being identical.

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Under these circumstances, this resolution also, as I understand it, should be considered on practical grounds.

The question of universal time will come on for consideration hereafter, and how that may be settled seems to me a matter of indifference compared with the decision on this resolution. I question, for myself, whether any other plan than that it proposes would be generally accepted. That is what I am afraid of. Whatever respect nations may have for this Conference, public opinion would be very strong upon the point now at issue. When you further recollect that all around the globe, in all these various seas, there are colonies with histories; that their geographical positions and boundaries were originally recorded by longitude according to the notation of which I have spoken, I think it is to be over sanguine to expect that those colonies will accept a new notation of longitude without greater proof of the positive necessity of the change. It would not be the fiat of this Conference, or the fiat of any government, that would bring about the change. I say this with all deference to the opinions of those who have advocated a change.

General STRACHEY, Delegate of Great Britain. At the risk of repeating somewhat my remarks made to the Congress when we last met, I would add a few words to what has now been said. It is our wish that the points of real difference should, as far as possible, be clearly brought out before the Conference comes to a vote.

As regards the counting of longitude in two directions, and the degree of advantage or disadvantage that may arise in starting from zero and treating east longitude as positive or plus, and west longitude as negative or minus, let me ask the attention of the Congress to the fact that longitude is already counted in these two directions, and that, as a matter of fact also, latitude is counted in the same way, in both directions from the equator, north latitude being plus and south latitude minus. Nobody, so far as I have heard, has ever proposed that we should abolish this method of reckoning latitude, and substitute for it North or South polar distance, to be counted right round the earth; and yet there is the same *quasi* scientific objection to the present method of counting in the one case as in the other. As already stated, it seems to me that, for purposes of practical convenience, it is extremely difficult, if not impossible, to separate the ideas on which the reckoning of longitude must be based, from those which must regulate the reckoning of time, and especially the reckoning of time in the sense of adopting a universal day over the whole world. Now, it appears to me that, as regards the acceptance of the universal day, it certainly will be anything but convenient, if it begins and ends otherwise than when the sun passes the 180th meridian. On the contrary, I think it will be extremely inconvenient. I think that if the world were to adopt the meridian of Greenwich as

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the origin of longitude, the natural thing for it to do would be to have the international day, the universal day, begin from the 180th meridian from Greenwich—that is, to coincide with the Greenwich civil day. That meridian passes, as I said before, outside of New Zealand, and outside of the Fijee Islands; it goes over only a very small portion of inhabited country. It appears to me, therefore, that inasmuch as there must be an absolute break or discontinuity in time in passing round the earth—a break of twenty-four hours—it is much more convenient that this break should take place in the uninhabited part of the earth than in the very centre of civilization.

If we adopt the universal day which coincides with the civil day at Greenwich, then you will be able to have complete continuity of local time over the whole earth, in harmonious relation with the universal day, except at the break which necessarily takes place on the 180th meridian. Otherwise this will not be possible. For instance, according to the system proposed by the resolution, the local time corresponding, say, to 0 hours of Monday at Greenwich, would, in passing round the earth to the eastward from the 180th meridian, gradually change from 12 hours of Sunday to 12 hours of Monday; and, on returning to that meridian, the break of time would occur, and one day would appear to be lost. But complete continuity both in the days and hours, and harmony with the universal day, that is, the Greenwich civil day, would be preserved for the whole earth, excepting on crossing the 180th meridian.

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The result of the system which was proposed at Rome would be to cause the break of dates to take place at Greenwich at noon, so that the morning hours of the civil day would have a different universal date from the afternoon hours, and this would be the case all over Europe. But if the universal day be made to correspond to the civil day of Greenwich, and the longitude is counted east in one direction and west in another direction to the 180th meridian, these difficulties would be overcome, and a perfectly simple rule would suffice for converting local into universal time. As regards what was said upon the subject of longitude being plus or minus, according as you move to the east or west, it appears to me that there is a positive, clear, and rational reason for calling longitude eastward plus and longitude westward minus. The time is later to the east, and therefore the hour is indicated by a higher number. In converting universal into local time, if the place is east of Greenwich, you add the longitude to the universal time, and therefore increase the number of the hour; if the place be west of Greenwich, you subtract the longitude, and therefore diminish the number of the hour. It is natural, therefore, to call east longitude positive and the other negative.

It appears to me also that the passage of the sun over the meridian is, in reality, what may be called the index of the day, the day consisting of 24 hours, distributed equally on either side of the meridian. Noon of the universal day would thus coincide with the time of the sun passing the initial meridian. There is perfect consistency, therefore, in adopting the reckoning of longitude and time that is proposed in the resolution before us. It is a rational and symmetrical method.

Mr. JUAN PASTORIN, the Delegate of Spain. I listened with great pleasure to the observations which our honorable colleague, the Delegate of England, General STRACHEY, has just made.

I am not sufficiently acquainted with the English tongue to make a speech, though I know it well enough to follow the debate. Moreover, as I had beforehand studied the subject which is now before us, I have quite well understood all that has been said on this point. I proposed an amendment yesterday, in order to obtain what I consider the most simple formula for converting local time into cosmical time. This formula is not, perhaps, the most suitable for astronomers and sailors, but they form the minority, and it is, I am sure, the easiest for the mass of the people. This

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formula would be based on the considerations which are now under discussion. I am not sufficiently familiar with the language to give the reasons upon which I based my amendment, but, as I demonstrated in the pamphlet which I had the honor of addressing to my learned colleagues, the means, in my opinion, of obtaining the simplest and the most suitable formula is to make the beginning of civil time and of dates on the first meridian coincide with the cosmical time and date, and to count longitude continuously in the same direction from the initial meridian. This is what I proposed to obtain by my amendment.

Count LEWENHAUPT, Delegate of Sweden. Mr. President, I now propose that the Conference take a recess for a few moments before a vote is taken upon the resolution.

No objection being made to the motion, the President announced that a recess would be taken until the Chair called the Conference to order.

THE PRESIDENT, having called the Conference to order, said. The recess has given an opportunity for an interchange of opinion upon the subject pending, and if the Conference be ready the vote will now be taken.

Commander SAMPSON, Delegate of the United States. Mr. President, I think that the informal discussion which we have had upon this question of the method of counting longitude must lead to the conclusion that there is a great difference of opinion. So far as I have been able to learn, many of the delegates have come here instructed to favor the resolution adopted by the Roman Conference. It is my own opinion that the recommendation to count longitude continuously from the prime meridian from west to east, as recommended by the conference at Rome, is not so good as the proposition now before us. Personally, however, I would prefer to see it counted continuously from east to west, as being more in conformity with present usage among astronomers. But, as it appears that so many delegates are instructed by their Governments to favor counting in the opposite direction, and as, if this Congress adopts any other plan than that proposed by the Conference at Rome, they will have to lay before their Governments as the action of this Congress something that will be opposed to the recommendation of the Roman Conference, and as these two recommendations would naturally tend to neutralize each other, I would favor the proposition which is now before us as being the most expedient.

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I would suggest, however, that, instead of making a positive declaration upon the question, we leave it as it now stands; that is to say, that longitude shall be counted east and west from the prime meridian, without specifying which direction shall be considered positive, and declare it to be the opinion of this Congress that it is not expedient to change the present method of counting longitude both ways from the prime meridian.

Count LEWENHAUPT, Delegate from Sweden. In my opinion the delegates have not undertaken to recommend the resolutions adopted by a majority of the Conference, but only the resolutions for which they have themselves voted. As regards the fact that there may be great differences of opinion concerning the questions which remain for our consideration, I am unable to see in it any reason for our not proceeding to vote upon them. On the contrary it will be of great interest to our Governments to know the exact position taken by each of the delegates, and even if any delegate should abstain from voting, such abstention would be of interest in the event of future negotiations on the subject. I am therefore of opinion that we should proceed to vote on the remaining resolutions.

The vote was then taken upon the resolution of the Delegate of the United States, Mr. RUTHERFURD, which is as follows:

"Resolved, That from this meridian (id est, Greenwich) longitude shall be counted in two directions up to 180 degrees, east longitude being plus and west longitude minus."

The following States voted in the affirmative:

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Chili,	Liberia,
Colombia,	Mexico,
Costa Rica,	Paraguay,
Great Britain,	Russia,
Guatemala,	Salvador,
Hawaii,	United States,
Japan,	Venezuela.

The following States voted in the negative:

Italy,	Sweden,
Netherlands,	Switzerland.
Spain,	

The following States abstained from voting:

Austria-Hungary,	Germany,
Brazil,	San Domingo,
France,	Turkey.

Ayes, 14; noes, 5; abstaining, 6.

The PRESIDENT then announced that the resolution was adopted.

Mr. RUTHERFURD, Delegate of the United States. Mr. President, I now propose to read the third resolution from the printed circular which has been furnished to the delegates. It is as follows:

"Resolved, That the Conference proposes the adoption of a universal day for all purposes for which it may be found convenient, and which shall not interfere with the use of local time where desirable. This universal day is to be a mean solar day; is to begin for all the world at the moment of midnight of the initial meridian coinciding with the beginning of the civil day and date of that meridian, and is to be counted from zero up to twenty-four hours."

This resolution is somewhat complex, and in order to facilitate debate, I propose that we first occupy ourselves only with the first clause, namely:

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"Resolved, That the Conference proposes the adoption of a universal day for all purposes for which it may be found convenient, and which shall not interfere with the use of local time where desirable."

After having disposed of that clause we can proceed to dispose of the other parts of the resolution.

The PRESIDENT. You propose, then, to divide the resolution as printed in the circular into two resolutions, and you now offer the first part for consideration.

Mr. RUTHERFURD, Delegate of the United States. If that is the more convenient form of putting it, it meets my views. It will be more easy to discuss the subject, more easy to arrive at a decision, in that form.

M. le Comte ALBERT DE FORESTA, Delegate of Italy. I propose as an amendment the fifth resolution of the Roman Conference, which reads as follows:

"The Conference recognizes, for certain scientific needs and for the internal service of great administrations of ways of communications, such as those of railroads, lines of steamships, telegraphic and postal lines, the utility of adopting a universal time, in connection with local or national times, which will necessarily continue to be employed in civil life."

The PRESIDENT. The question is now upon the amendment offered by the Delegate of Italy.

Professor ABBE, Delegate of the United States. I would like to ask whether this amendment adds anything substantially to the resolution. I think it does not. It simply specifies the details of the resolution pending before us. That resolution "proposes the adoption of a universal day for all purposes for which it may be found convenient." That is general. The amendment merely specifies certain of these purposes. That is a matter of detail.

Mr. ALLEN, Delegate of the United States. Mr. President, I desire to offer an amendment to the amendment, as follows:

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"Civil or local time is to be understood as the mean time of the approximately central meridian of a section of the earth's surface, in which a single standard of time may be conveniently used."

Mr. RUTHERFURD, Delegate of the United States. Mr. President, it does not seem to me that it is within the competence of this Conference to define what is local time. That is a thing beyond us.

Mr. W. F. ALLEN, Delegate of the United States, then said: Mr. President and gentlemen, all efforts to arrive at uniformity in scientific or every-day usage originate in a desire to attain greater convenience in practice. The multiplicity of coins of which the relative value can only be expressed by fractions, the various common standards of weights and of measures, are inconvenient both to the business man and the scientist. Alike inconvenient to both are the diverse standards of time by which the cities of the world are governed, differing, as they do, by all possible fractions of hours.

All coins have a relative and interchangeable value based upon their weight and fineness. Weights and measures remain the same by whatever unit they may be expressed; but, primarily, time can only be measured by a standard actually or apparently in motion. Absolutely accurate mean local time, varying, as it does, by infinitesimal differences at every point in the circuit of the earth, may be shown on a stationary object, but cannot in general be kept by an individual or object in motion. The mean local time of some fixed point in each locality must be taken as the standard for practical use. The important question to be determined is, over what extent of territory, measuring east and west from such fixed point, its mean time may be employed for all ordinary purposes without inconvenience. This can be absolutely determined only by practical experience.

Careful study of this phase of this subject led, perhaps, more directly than any one single cause, to the proposal of the detailed system of standard time which now satisfactorily controls the operations of one hundred and twenty thousand miles of railway in the United States and Canada, and governs the movements of fifty millions of people.

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Before the recent change there were a number of localities where standards of time were exclusively employed which varied as much as thirty minutes, both on the east and the west, from mean local time, without appreciable inconvenience to those using them. From this fact the conclusion was inevitable that within those limits a single standard might be employed. The result has proved this conclusion to have been well founded.

No public reform can be accomplished unless the evil to be remedied can be made plainly apparent. That an improvement will be effected must be clearly demonstrated, or the new status of affairs which will exist after the change, must be shown to have been already successfully tried. Here, as in law, custom and precedent are all powerful. It would be a difficult task to secure the general adoption of any system of time-reckoning which cannot be employed by all classes of the community. Business men would refuse to regard as a reform any proposition which introduced diversity where uniformity now exists, nor would railway managers consent to adopt for their own use a standard of time not coinciding with or bearing a ready relation to the standard employed in other business circles. To adopt the time of a universal day for all transportation purposes throughout the world, and to use it collaterally with local time, would simply restore, and possibly still more complicate, the very condition of things in this country which the movement of last year was intended to and did to a great extent obviate. Railway managers desire that the time used in their service shall be either precisely the same as that used by the public, or shall differ from it at as few points as possible, and then by the most readily calculated differences. The public, on the other hand, have little use for absolutely accurate time, except in connection with matters of transportation, but will refuse to adopt a standard which would materially alter their accustomed habits of thought and of language in every-day life. That this position is absurd may be argued, and, perhaps, admitted, but it is a fact, and one which cannot be disregarded.

The adoption of the universal day or any system of time-reckoning based upon infrequent—such as the great quadrant—meridians, to be used by transportation lines collaterally with local time, is, therefore, practically impossible.

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Shall it, then, be concluded that there is no hope of securing uniformity in time-reckoning for practical purposes? Or does the proposition for the general division of the earth's surface into specified sections, governed by standards based upon meridians fifteen degrees or one hour apart, supply the remedy? Objections have been urged against this proposition on account of difficulties encountered, or supposed to be encountered, in the vicinity of the boundary lines between the sections. It is argued that the contact of two sections with standards of time differing by one hour will cause numerous and insuperable difficulties. In railway business, in which time is more largely referred to than in any other, the experience of the past year has proved this fear to be groundless. It is true that the approximate local time of a number of cities near the boundary lines between the eastern and central sections in the United States is still retained. A curious chapter of incidents could be related which led to this retention, not affecting, however, the merits of the case; but the fact serves to show that changes much greater than thirty minutes from local time would not be acceptable.

Adjacent to and on either side of all national boundary lines the inhabitants become accustomed to the standards of weights, measures, and money of both countries, and constantly refer to and use them without material inconvenience. In the readjustment of a boundary upon new lines of demarcation it must be expected that some temporary difficulties in business transactions will be encountered, but all history shows that such difficulties soon adjust themselves. Legal enactments

will finally determine the precise boundaries of the several sections. If different laws respecting many other affairs of life may exist on either side of a State or national boundary line, with positive advantage or without material inconvenience, why should laws respecting time-reckoning be an exception? Coins and measures are distinguished by their names. So, also, may standards of time be distinguished.

The adoption of standard time for all purposes of daily life, based upon meridians fifteen degrees apart, would practically abolish the use of exact local time, except upon those meridians. Numerous circumstances might be related demonstrating how very inaccurate and undetermined was the local time used in many cities in this country before the recent change.

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Except for certain philosophical purposes, does the inherent advantage claimed in the use of even approximately accurate local time really exist? Would the proposed change affect any custom of undoubted value to the community? These questions have been answered in the negative by the experience of Great Britain since January 13, 1848, of Sweden since January 1, 1879, and of the United States and Canada since November 18, 1883.

Greenwich time is exclusively used in Great Britain, and differs from mean local time about eight minutes on the east and about twenty-two and a half minutes on the west. In Sweden the time of the fifteenth degree of east longitude is the standard for all purposes. It differs from mean local time about thirty-six and a half minutes on the east and about sixteen minutes on the west. In the United States the standards recently adopted are used exclusively in cities like Portland, Me., (33,800 inhabitants,) and Atlanta, Ga., (37,400 inhabitants,) of which the local times are, respectively, nineteen minutes and twenty two minutes faster than the standard, and at Omaha, Neb., (30,500 inhabitants,) and Houston, Tex., (16,500 inhabitants,) each twenty-four minutes slower. At Ellsworth, Me., a city of six thousand inhabitants, a change of twenty-six minutes has been made. Nearly eighty-five per cent. of the total number of cities in the United States of over ten thousand inhabitants have adopted the new standard time for all purposes, and it is used upon ninety-seven and a half per cent. of all the miles of railway lines.

Let us now consider whether insuperable practical difficulties owing to geographical peculiarities will prevent the adoption of this system throughout the world.

A table has been prepared, and accompanies this paper, upon which are designated the several governing meridians and names suggested for the corresponding sectional times. For the use of this table I am indebted to Mr. E. B. Elliott, of this city.

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On the North American continent, in the United States and Canada, the 75th, 90th, 105th, and 120th west Greenwich meridians now govern time. In Mexico the 105th west meridian is approximately central, except for Yucatan, which is traversed by the 90th. For Guatemala, Salvador, and Costa Rica, the 90th west meridian is approximately central. San Domingo closely approaches and Cuba touches the 75th.

In South America—the United States of Columbia, Ecuador, Peru, the western portion of Bolivia, and Chili would use the time of the 75th west meridian, while Venezuela, Guiana, western Brazil, including the Amazon River region, eastern Bolivia, Paraguay, Uruguay, and the Argentine Republic, would be governed by the time of the 60th meridian. In eastern Brazil the 45th west meridian would govern.

Passing to Europe, we find Great Britain already governed by the zero meridian time, which can also be used in the Netherlands, Belgium, France, Spain, and Portugal. The 15th east meridian, which is about as far east of Berlin as west of Vienna, and no more distant from Rome than from Stockholm, now governs all time in Sweden. This time could also be advantageously used in Denmark, Germany, Austria-Hungary, Switzerland, Italy, and Servia. The time of the 30th east meridian, which is nearly the mean between Constantinople and St. Petersburg times, could be used in Western Russia, Turkey, Roumania, Bulgaria, East Roumelia, and Greece. When the development of Eastern Russia in Europe shall require it, the division of that great country between the times of the 30th and 45th east meridians, upon lines of convenience similar to those employed in the United States, can doubtless be arranged. The governing meridians for Africa appear to present some advantages, especially for Egypt, and no insuperable difficulties; but for continents where the boundaries of countries are so loosely defined, the limits of time-reckoning cannot well and need not now be shown. They would ultimately adjust themselves.

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In Asia the 60th east meridian passes through Khiva. Bombay would use the 75th and Calcutta the 90th. The 105th east meridian touches Siam, the 120th is near Shanghai, and the 135th passes through Japan and near Corea. The 150th meridian of west longitude is sufficiently near Hawaii. In Australia the 150th, 135th, and 120th meridians of east longitude are admirably located for governing, respectively, the time of the eastern, central, and western divisions of that continent.

In none of the localities defined or mentioned, would the standards proposed vary more from mean local time than has already been demonstrated to be practicable without detriment to any material interest. Convenience of use, based largely upon the direction of greater commercial intercourse, would determine the action of communities other than those mentioned, and probably somewhat modify the schedule proposed.

That no practical difficulty of usage would prevent the universal adoption of the hour-section system of time-reckoning is apparent. Its convenience has been abundantly realized. In adopting it, practically no expense whatever is incurred. The alteration of the works or faces of watches or clocks is not required. Their hands are simply set to the new standard, and the desired result is accomplished.

By the adoption of this system, the exact hours of time-reckoning, although called by different names in the several sections for every-day life, but specifically designated, if desired, for scientific purposes, would be indicated at the same moment of time at all points. The minutes and seconds would everywhere agree. The absolute time of the occurrence of any event could, therefore, be readily determined. The counting of the hour meridians should begin where the day begins at the transition line.

It would then be one of the possibilities of the powers of electricity that the pendulum of a single centrally located clock, beating seconds, could regulate the local time-reckoning of every city on the face of the earth.

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Table of Standards governing the Hour-Section System of Time-reckoning.

Longitude from Greenwich. Degrees.	H O U R M E R I D I A N S .		Simultaneous hours in the several sections.
	Proposed names of sectional times.	Numbers.	
180	Transition time	0 or 24th	12 midnight

Longitude from Greenwich.	H O U R M E R I D I A N S .	Proposed names of sectional times.	Numbers.	Simultaneous hours in the several sections.
165 west		Alaskan	1st.....	1 A. M.
150		Hawaii	2d	2
135		Sitka	3d	3
120		Pacific (Adopted in U.S. and Can.)	4th.....	4
105		Mountain	5th.....	5
90		Central (American) time	6th.....	6
75		Eastern (or Coastwise)	7th.....	7
60		La Plata	8th.....	8
45		Brazilian	9th.....	9
30		Central Atlantic	10th.....	10
15		West African	11th.....	11
0		Internat'l or Univers'l (Used in Gt. Britain)	12th.....	12 noon.
15 east		Continental (Used in Sweden.)	13th.....	1 P. M.
30		Bosporus	14th.....	2
45		Caucasus	15th.....	3
60		Ural	16th.....	4
75		Bombay	17th.....	5
90		Central Asian	18th.....	6
105		Siam	19th.....	7
120		East Asian	20th.....	8
135		Japan	21st.....	9
150		East Australian	22d.....	10
165		New Caledonian	23d.....	11

I have no desire, however, to press on the Conference the consideration of the question of local time reckoning. But, as the system adopted in the United States and Canada has proved successful, and is now firmly established, I have deemed it proper that a statement of this fact and of the possibilities of the application of the system to other parts of the world should be made to the Congress. I will now, therefore, withdraw my amendment.

Mr. RUTHERFURD, Delegate of the United States. The Delegate of Italy has moved, as an amendment to the first part of the resolution offered by me, the fifth resolution adopted in the Conference at Rome. Really, in spirit and in substance, there is little or no difference between them, except that the Conference at Rome has specified that the objects they had in view as suitable for regulation by universal time were these, namely: "For the internal service of the great administrations of means of communication, such as railways, steamships, telegraphs, and post-offices."

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Now, I submit that in the words used in my resolution all this is embraced, and a good deal more, for this universal day is to be adopted "for all purposes for which it may be found convenient." If it were desirable that every purpose for which the universal day may be found convenient should be specified, it would make a very long resolution. On the other hand, however, we might find in the end that we had omitted some of the purposes for which it was eminently convenient. It appears, also, that in this same fifth Roman resolution all questions of chronology of universal date, etc., are omitted, although they are brought forward and appear in the sixth resolution. It seems to me, Mr. President, that nothing would be gained by the adoption of this amendment, for everything that is embraced there is more comprehensively embraced in the original resolution.

General STRACHEY, Delegate of Great Britain. In explanation of the amendment offered by the Delegate of Italy, let me call attention to what really passed at the Roman Conference. I find, first

of all, in the report of the Roman Conference, in the abstract of the discussion before the Special Committee, these words, (p. 49 of the reprint:)

"The fourth resolution, in favor of a universal hour for certain scientific and practical purposes, is unanimously adopted."

There appears no discussion whatever upon it; not a word seems to have been said as to how it should be defined or acted upon. I then turn back to the report of the committee which prepared the resolutions, and there we see what, in reality, they had in their minds when they drew up that resolution. It is perfectly evident that they had no intention of tying the hands of anybody. This is what they say on page 26 of the report:

"The administrations of railroads, of the great steamship lines, telegraph lines, and postal routes, which would thus secure for their relations with each other a uniform time, excluding all complication and error, could nevertheless not entirely avoid the use of local time in their relations with the public. They would probably use the universal time only in their internal service, for the rules of the road, for the time-tables of their engineers and conductors, for the connection of trains at frontiers, etc.; but the time-tables for the use of the public could hardly be expressed otherwise than in local or national time. The depots or stations of the railroads, post-offices, and telegraph offices, and the waiting-rooms, could exhibit outwardly clocks showing local or national time, while within the offices there would be, besides, clocks indicating universal time. Telegraphic dispatches could show in future the time of despatch and of receipt, both in local and universal time."

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Now, I think that the subject of universal time is dealt with in a better manner in the proposition offered by Mr. RUTHERFURD than in the proposition which emanated from the Congress at Rome. This Conference cannot designate positively the manner in which local time may be best reckoned. We are concerned now only with universal time. It may, however, be proper that the resolution offered by Mr. RUTHERFURD in regard to the employment of universal time should be supplemented by something more specific—something, for instance, of this sort:

The Conference will not designate the system on which local time may best be reckoned so as to conform, as far as possible, to universal time; this should be determined by each nation to suit its convenience.

The arrangements for adopting universal time for the use of international telegraphs will be left for regulation by the telegraph international congress.

This last idea was expressed, I forget now by whom, but by one of the Delegates since the Conference met, and it appears to me that inasmuch as there is an international congress specially appointed to regulate all matters of international telegraphy, this subject can be left to them with the firm belief that it will be regulated satisfactorily.

The question was then put to the vote; and upon the amendment offered by the Delegate of Italy the following States voted in the affirmative:

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Colombia,	Paraguay,
Italy,	Spain,
Netherlands,	Sweden.

The following in the negative:

Brazil,	Liberia,
Chili,	Mexico,
Costa Rica,	Russia,
France,	Salvador,
Germany,	San Domingo,
Great Britain,	Switzerland,
Guatemala,	Turkey,
Hawaii,	United States,
Japan,	Venezuela.

Austria-Hungary abstained from voting.

Ayes, 6; noes, 18; abstaining, 1.

So the amendment was lost.

The question then recurred upon the original resolution.

Mr. RUTHERFURD, Delegate of the United States. Mr. President, it has been represented to me that it may, perhaps, be found advantageous in different countries and different localities to use a time that would not be accurately described as local time. In one place the standard of time may be strictly local time; in another place it may be national time; in another place it may be railroad time.

In order to meet this condition of things, I propose to alter the phraseology of the original resolution in this way: by inserting the words "or other," so that it shall read "which shall not interfere with the use of local or *other* time where desirable."

Professor ADAMS, Delegate of Great Britain. May it not be better to put it in this way: "Which shall not interfere with the use of local or other *standard* time where desirable."

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Mr. RUTHERFURD, Delegate of the United States. I accept the amendment offered by the Delegate of Great Britain.

Mr. JEAN VALERA, Delegate of Spain. As I consider that both the amendment which was just rejected and the present proposition really signify the same thing, I shall vote for the proposition, as I before did for the amendment.

The PRESIDENT. The question is now upon the resolution, as modified. It will be read.

The resolution was then read, as follows:

"Resolved, That the Conference proposes the adoption of a universal day for all purposes for which it may be found convenient, and which shall not interfere with the use of local or other standard time where desirable."

The following States voted in the affirmative:

Austria-Hungary,	Mexico,
Brazil,	Netherlands,
Chili,	Paraguay,
Colombia,	Russia,
Costa Rica,	Salvador,
France,	Spain,

Great Britain,
Guatemala,
Hawaii,
Italy,
Japan,
Liberia,

Sweden,
Switzerland,
Turkey,
United States,
Venezuela.

There were no negative votes.

Germany and San Domingo abstained from voting.

Ayes, 23; noes, 0; abstaining, 2.

So the resolution was carried.

Mr. RUTHERFURD, Delegate of the United States. Mr. President, I now propose to offer the other portion of the resolution, or rather I propose to offer the other portion in the form of a distinct resolution. It will run as follows:

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"Resolved, That this universal day is to be a mean solar day; is to begin for all the world at the moment of midnight of the initial meridian, coinciding with the beginning of the civil day and date of that meridian; and is to be counted from zero up to twenty-four hours."

This is, in substance, the resolution adopted by the Conference at Rome, with the exception that the Conference at Rome proposed that the universal day should coincide with the astronomical day instead of the civil day, and begin at Greenwich noon, instead of Greenwich midnight.

Professor ADAMS, Delegate of Great Britain. I desire to make one remark merely. Would it not be a little more correct if we said "at the moment of mean midnight?" I think I have mentioned this before, but, to be clear, I think it should be made.

Mr. RUTHERFURD accepted Professor ADAMS's suggestion.

Mr. JUAN VALERA, Delegate of Spain. Mr. President, I wish to call special attention to the proposition now before us, on which we are called upon to vote, as it is of very great importance.

As for me, I acknowledge that my mission is already fulfilled. The Government of Spain had directed me to admit the necessity or the usefulness of a common prime meridian, and also to accept the meridian of Greenwich as the universal meridian. I have attended to these directions.

We have now to deal with a scientific question on which I cannot well express an opinion, as I do not feel that I am competent in such matters; besides, I am not authorized to do so. This may be due to my ignorance in matters of this kind, but I fear that extraordinary difficulties may arise in the adoption of this proposition, and if we proceed with too great haste, we run the risk of placing ourselves in contradiction to common sense. All the popular ideas of men for thousands of years past will, perhaps, be overturned. It may happen that when the day begins at Greenwich it will be 23 hours later at Berlin. The east will be confounded with the west, and the west with the east. If we made the day begin at the anti-meridian these questions would be avoided, and we should at one be with the rest of the human race. I believe that it would be better to adjourn till to-morrow to give us time to reflect; in this way we shall not risk by our devotion to science drawing upon ourselves popular criticism.

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I propose, therefore, that the vote on this question be put off till to-morrow.

"M. LEFAIVRE", Delegate of France. Not to-morrow.

Count LEWENHAUPT, Delegate of Sweden. I beg to propose as an amendment the sixth resolution adopted by the Conference at Rome, which is as follows:

The Conference recommends as initial point for the universal hour and the cosmic day the mean midday of Greenwich, coinciding with the moment of midnight or the beginning of the civic day at the meridian 12 hours or 180° from Greenwich.

The universal hours are to be counted from 0 up to 24 hours.

The PRESIDENT. The Chair quite concurs with the Delegate of Spain in thinking that it would be very proper for us to take some time to consider this matter.

A motion to adjourn would be in order, but before that motion is made, the Chair would like to read a communication which he has just received from the Assistant Secretary of State. It is this:

"The President of the United States will receive the members of the Conference on Thursday, the 16th instant, at 12 o'clock, at the White House."

The Assistant Secretary of State proposes that we shall meet here at a quarter before 12, and go to the White House from this hall.

The PRESIDENT. If the Delegate of Spain will withdraw his motion to adjourn for one moment, the Delegate of Sweden desires to offer a resolution.

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Count LEWENHAUPT, Delegate of Sweden, then read the following proposal:

Hereafter the reports of the speeches, whether in English or French, will be sent as soon as possible to the Delegates who made them, and the proofs should be corrected and returned by them without delay to the Secretary. No correction will be allowed afterward, except such as are considered necessary by the Secretaries, who will meet as soon as possible after the first corrections shall have been printed to prepare the protocols for the approval of the Conference.

The motion being put to a vote by the President, was unanimously carried.

The PRESIDENT. The Chair would very informally state that he has received to-day a letter from Sir William Thomson, the distinguished scientist who addressed the Conference yesterday, expressing his regret that he did not then say something which he had in his mind and which he wished to say, namely, that the meridian of Greenwich passes directly through the great commercial port of Havre.

Mr. JANSSEN, Delegate of France. Since the Chairman refers to this subject, I may state to my colleagues that I have received a telegram from Sir William Thomson, in which he makes certain propositions of the nature described.

Yet it is not possible to make out precisely, by this telegram, what are Sir William Thomson's ideas. All that I can say is, that whatever proceeds from such an eminent man should be treated with great consideration, and that is a reason for asking Sir W. Thomson to be good enough to explain to me his ideas more fully. If we could adjourn to Monday, I think that it would be better. The preparation of the protocols is very much behind-hand, and it is desirable that the members of the Conference

be kept fully acquainted with all the discussions. I would, therefore, suggest that we adjourn till Monday.

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The PRESIDENT. There are several propositions to adjourn to different days. The Chair will take them up in order and will first put the question upon the motion to adjourn until Monday.

The motion was carried, and at four o'clock the Conference adjourned until Monday, the 20th instant, at one o'clock p. m.

VI.

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SESSION OF OCTOBER 20, 1884.

The Conference met, pursuant to adjournment, in the Diplomatic Hall of the Department of State, at one o'clock p. m.

Present:

Austro-Hungary: Baron IGNATZ VON SCHÆFFER.

Brazil: Dr. LUIZ CRULS.

Chili: Mr. F. V. GORMAS and Mr. A. B. TUPPER.

Colombia: Commodore S. R. FRANKLIN.

Costa Rica: Mr. JUAN FRANCISCO ECHEVERRIA.

France: Mr. A. LEFAIVRE, Mr. JANSSEN.

Germany: Baron H. VON ALVENSLEBEN, Mr. HINCKELDEYN.

Great Britain: Sir F. J. O. EVANS, Prof. J. C. ADAMS,
Lieut.-General STRACHEY, Mr. SANDFORD FLEMING.

Gautemala: Mr. MILES ROCK.

Hawaii: Hon. W. D. ALEXANDER.

Italy: Count ALBERT DE FORESTA.

Japan: Professor KIKUCHI.

Liberia: Mr. Wm. COPPINGER.

Mexico: Mr. LEANDRO FERNANDEZ, Mr. ANGEL ANGUIANO.

Netherlands: Mr. G. DE WECKHERLIN.

Paraguay: Capt. JOHN STEWART.

Russia: Mr. C. DE STRUVE, Major-General STEBNITZKI, Mr.
J. DE KOLOGRIVOFF.

San Domingo: Mr. DE J. GALVAN.

Spain: Mr. JUAN VALERA, Mr. EMILO RUIZ DEL ARBOL, Mr.
JUAN PASTORIN.

Sweden: Count CARL LEWENHAUPT.

Switzerland: Col. EMILE FREY.

Turkey: RUSTEM EFFENDI, ,

United States: Rear-Admiral C. R. P. RODGERS, Mr. LEWIS
M. RUTHERFURD, Mr. W. F. ALLEN, Commander W. T.
SAMPSON, Professor CLEVELAND ABBE.

Venezuela: Dr. A. M. SOTELDO.

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Absent:

Denmark: Mr. C. S. A. DE BILLE.

Hawaii: Hon. LUTHER AHOLO.

Salvador: Mr. ANTONIO BATRES.

The PRESIDENT. Some days ago a Committee was appointed to report on communications addressed to the Conference through the Chair. All communications that have been received from time to time, and they have been numerous, have been referred to this committee, of which the Delegate from England, Prof. ADAMS, is the chairman. He now informs the Chair that he is prepared to make a report.

The Delegate of England, Prof. ADAMS, then read the following report:

Letter from the President of the Conference.

INTERNATIONAL MERIDIAN CONFERENCE,

DEPARTMENT OF STATE, WASHINGTON, Oct. 14, 1884.

SIR: I have the honor to submit to the Committee of which you are the Chairman the following communications:

No. 1. Letters from Mr. Roumanet du Cailland, through Mr. Hunter, Ass't Sec. of State.

No. 2. Letter and communication from Mr. C. M. Raffensparger.

No. 3. Letter from Mr. A. S. de Chancourtois, accompanying books from Paris.

No. 4. Letter from Mr. A. W. Spofford, enclosing letter of Mr. J. W. Stolting, of Dobbs' Ferry.

No. 5. Letter from Mr. B. Aycrigg, Passaic, N. J.

No. 6. Letter from J. T. Field, St. Louis, Mo.

No. 7. Letter and two enclosures from Mr. Theodor Pæsche.

No. 8. Description of the Universal Time-Piece of Dr. A. M. Cory.

No. 9. Letter and enclosure from Mr. E. R. Knorr.

No. 10. Letter from Mr. J. E. Hilgard, of the U. S. Coast Survey and Geodetic Survey.

No. 11. Arguments by Committee of New York and New Jersey branch, and other papers relating to weights and measures.

No. 12. Letter from Lt. C. A. S. Totten, U.S.A., in relation to a Standard Meridian.

No. 13. Letter from Mr. J. P. Merritt, in relation to the Metric System.

No. 14. Postal card from W. H. Yates, in relation to the Mercator Projection.

No. 15. A New System of Mensuration, by Lawrence S. Benson.

No. 16. Letter of T. C. Octman, of Hope Mills, N. C., calling attention to the fact that the meridian of Greenwich passes through Havre.

No. 17. Letter from Dr. H. K. Whitner, explaining his notation of 24 hours.

I am, sir, with great respect, your obedient servant,

C. R. P. RODGERS,
President International Meridian Conference.

Prof. J. C. ADAMS.

Report of the Committee.

The Committee on communications respectfully reports as follows:

We have carefully examined all of the communications referred to us, as enumerated in the letter of President Rodgers, with the following results:

No. 1 recommends that the meridian of Bethlehem be adopted as the initial meridian. This question has been already disposed of by the Conference; therefore further consideration of the proposition is unnecessary.

No. 2 refers to an invention, the author of which states that "a patent has been applied for," consequently your Committee does not feel called upon to express any opinion upon it.

No. 3 is a letter from M. de Chancourtois, accompanying a work by him which contains an elaborate program of a system of geography based on decimal measures, both of time and of angles, and on the adoption of an international meridian.

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The work also contains copious historical notices on the metric system and on the initial meridian.

A copy of this work was presented to each of the Delegates prior to the discussions of the Conference with regard to the choice of an initial meridian, and therefore no special report of the author's views on this subject appears to your committee to be necessary. These views are nearly identical with those which were so ably laid before the Conference by Professor Janssen, but which failed to meet with their approval.

The author further proposes to supersede the present mode of measuring both angles and time by a system in which the entire circumference and the length of the day should each be first divided into four equal parts, and then each of these parts should be subdivided decimally.

However deserving of consideration these proposals may be, in the abstract, your Committee are clearly of the opinion that they do not fall within the limits indicated by the instructions which we have received from our respective governments, and that, therefore, any discussion of them would only be of a purely academical character, and could lead to no practical result. Such a discussion would be sure to elicit great differences of opinion, and would, therefore, occupy a considerable time.

Hence, your Committee think that it would be very undesirable for the Conference to enter upon it.

No. 4 is a letter from Mr. Spofford, Librarian of Congress, including a communication of Mr. J. W. Stolting, Dobbs' Ferry, N. Y. The author recommends the adoption of the meridian 162° W. from Greenwich as the prime meridian; he proposes further, not to say east or west, but first or second half, and also recommends the adoption of a universal time, not to interfere with local or other standard time, and to reckon from "1 to 24." He expresses no opinion as to whether the day should begin at noon or midnight. There seems to be nothing in the communication to influence the decisions of the Conference.

No. 5. See report as to letter No. 1.

No. 6 suggests that the prime meridian should be 180° from Greenwich, and that longitude should be reckoned from 0° to 360°. This proposition has been already considered and rejected by the Conference.

No. 7. This communication proposes "to adopt as the prime meridian the frontier line between Russia and the United States, as defined in the treaty of March 30, 1867." As the initial meridian has already been agreed to by the Conference, this proposition needs no further notice.

No. 8. This communication refers to an invention which has no bearing on the question before the Conference. The committee therefore abstain from expressing an opinion as to its merits.

No. 9. Two letters from Mr. E. R. Knorr, of Washington, D.C., advocating the advisability of reckoning longitude "westward from 0° to 359°," and marking them on charts by time instead of by degrees. The Conference has already taken action on the question involved.

No. 10. A letter from Prof. Hilgard, enclosing a pamphlet by Lt. C. A. S. Totten on the metrology of the great pyramid, a subject which does not fall within the scope of the subjects presented for the consideration of this Conference. In the enclosing letter Prof. Hilgard says: "I am purely and squarely for Greenwich midnight as the beginning of the universal day, and an east and west count of longitude; that is, 180° each way."

No. 11 advocates the preservation of the Anglo-Saxon system of weights and measures. This subject being foreign to the questions under consideration by this Conference, the Committee deems further comment unnecessary.

No. 12. A letter from Lieut. C. A. S. Totten, U.S.A., advocating a prime meridian through the great pyramid. The proposition involved has already been decided by the Conference.

No. 13 recommends redistribution of time according to the decimal system. As already remarked under No. 3, this proposition is clearly not within the limits indicated by the instructions which we have received from our respective governments.

No. 14 states that the author has a plan by which "chronometers will record the longitude equably." This proposition is foreign to the subjects under consideration by the Conference.

No. 15 proposes a new system of mensuration; and, therefore, this does not fall within the subjects for consideration by the Conference.

No. 16. This communication suggests that as the prime meridian passes through Havre, it should be allowable to call it by that name. This Committee recommends that the prime meridian be not named after the localities through which it passes, but be called simply "The Prime Meridian."

No. 17 is the subject of a patent. The Committee does not feel called upon to express an opinion respecting it.

This report is respectfully submitted to the Conference.

J. C. ADAMS,
Chairman Committee on Communications.

WASHINGTON, Oct. 18th, 1884.

The PRESIDENT. The report of the Committee is before the Conference.

Mr. RUTHERFURD, the Delegate of the United States. I move that the report be accepted, and its conclusions adopted.

There being no objection, the report was adopted.

The PRESIDENT. In the regular order of business to-day, the first subject before the Conference is the resolution offered on Saturday by the Delegate of the United States, Mr. RUTHERFURD, with the amendment offered by the Delegate of Sweden, Count LEWENHAUPT.

The resolution is as follows:

"Resolved, That this universal day is to be a mean solar day, is to begin for all the world at the moment of mean midnight of the initial meridian coinciding with the beginning of the civil day and date of that meridian, and is to be counted from zero up to twenty-four hours."

The amendment offered is as follows:

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"The Conference recommends as initial point for the universal hour and the cosmic day the mean mid-day of Greenwich, coinciding with the moment of midnight or the beginning of the civil day at the meridian 12 hours or 180° from Greenwich."

"The universal hours are to be counted from 0 up to 24 hours."

Mr. VALERA, the Delegate of Spain, said that he thought that the amendment of the Delegate of Sweden should be first discussed.

Mr. JANSSEN, the Delegate of France. At the last session I informed the Congress that I had received a telegram from Sir William Thomson upon the question of the meridian. Since then, that illustrious foreign member of the Institute of France has written me a very kind letter upon the subject, in which he expresses his complete appreciation of the disinterested attitude taken by France in this Congress. I thank Sir William Thomson for his sentiments towards France, and I am persuaded that, with such excellent feelings, we should arrive at an understanding, upon scientific bases, in which the moral and material interests of all would be equitably adjusted, as we have always understood them.

But the question is not open now, and this Congress would, doubtless, not be disposed to reopen it. Sir William Thomson will understand, therefore, that in the present condition of affairs we have only to maintain the attitude which we have taken and the votes which we have given.

The PRESIDENT. The Chair will simply say to the Conference that he very informally alluded to the letter that he had received from Sir William Thomson, and the Chair would also say in answer to the Spanish Minister that the rule in this Conference, a simple one, is to discuss the last amendment offered and dispose of it, instead, as suggested by the Delegate of Spain, of taking up the one most important in its character. It would be somewhat difficult for the Chair to decide on all occasions which amendment is the most important. I think, therefore, as Chairman, that I will pursue the rule in force in this country, and, unless the Conference order otherwise, shall present the amendment which is the last offered.

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Mr. RUIZ DEL ARBOL, Delegate of Spain. Mr. Chairman, the Spanish Minister has not referred to the most important amendment, but to the most radical. For instance, here there are several

propositions to select a meridian; one of them must be considered, and it seems to me that my amendment, which is the most radical, is the one to be first presented to the Conference.

The PRESIDENT. Unless the Conference shall direct otherwise, the Chair must pursue the principle on which it has acted hitherto, taking the amendments in the order in which they are offered, and presenting them inversely for the action of the Conference. The proposition before the Conference, therefore, is the amendment offered by the Delegate of Spain, Mr. ARBOL, which is as follows:

"Having accepted the meridian of Greenwich to account the longitudes, as a general need for practical purposes, but thinking that the introduction of any new system of time-reckoning is far more scientific and important, and liable to great difficulties and confusion in the future, we propose the following resolution:

"*Resolved*, The Congress, taking in consideration that there is already a meridian tacitly accepted by almost all the civilized nations as the origin of dates, the anti-meridian of Rome, abstains from designating any other meridian to reckon the universal time."

Mr. RUIZ DEL ARBOL, Delegate of Spain. It is proposed to introduce an absolute universal or cosmopolitan system of time-reckoning, which, it is hoped, will, at a more or less distant day, be generally adopted, not only for scientific purposes, but for all the ordinary purposes of life for which it can possibly be used; and it is further proposed to designate a meridian at which this cosmopolitan time-reckoning is to begin. What I have to state is, that this method of absolute time-reckoning already exists, (although we do not use it,) as does this universal meridian which has been tacitly chosen by almost all civilized nations—that is to say, by all such as have adopted the Julian calendar, with or without the Gregorian correction. Thus it is that anything involving even a slight modification of our present system is nothing more than a chronological reform, which I do not feel certain that it will be well for us to introduce or recommend, and with regard to which I have my doubts whether it will be received with unanimous or hearty approval.

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In fact, gentlemen, all nations that have adopted the Julian and Gregorian systems of time-reckoning have necessarily accepted their consequences, and these consequences are, as Rome told us in the time of Caesar and in that of Gregory XIII, that we must reckon our days according to certain fixed dates; some part of the world had to reckon their dates before all the rest, and as Rome consented that countries situated to the east of it should reckon their date before it and countries situated to the west after it, it is evident that both reckonings had to meet at some point on some meridian, which was and could be no other than the anti-meridian of Rome. Nature itself seems to have lent its sanction to this, since the anti-meridian of Rome crosses no continent, and, probably, no land whatever.

Let us suppose, for the sake of illustration, that it were agreed to abandon the Gregorian system of reckoning at a given moment, and to adopt another; that it were agreed to abandon it at all points on the globe when the hour should be twelve o'clock at noon at Greenwich, on the first day of January, 1885; and let us suppose that for historical or scientific purposes we were interested in knowing exactly how long the Gregorian system had been in use. Is it possible to ascertain this? It is; and very easily. Using that system of universal time-reckoning which it is proposed to establish, but logically referring it to the origin of that cosmopolitan reckoning which really exists, that is to say, to the anti-meridian of Rome, we shall find that 1885 years have been reckoned according to the Gregorian system, plus the difference of longitude between the anti-meridians of Greenwich and Rome. Nothing is more certain than this, and there is no other way of solving the problem. As I

have already shown, when the Gregorian correction was made, the day which, according to the old mode of reckoning, would have been the 5th of October, was called the 15th of October, 1582; the countries situated to the east of Rome had, however, previously begun to reckon according to the new system (previously in absolute time I mean,) and the countries situated to the west adopted it successively afterwards. Now, then, as that portion of the globe which lies to the east of any given point or meridian is nothing more or less than one hemisphere, and as that which lies to the west is another hemisphere, it is evident that, at the anti-meridian of Rome, the two meridians, which constantly differ by one day in their dates, are confounded, and that the anti-meridian of Rome, being the first one in the world that adopted the Julian and the Gregorian systems of reckoning, is the prime meridian of the world, the meridian by which we now reckon, and ought to reckon universal time, until the establishment of a different system. If we had, at the present time, to settle any question depending on dates, in the region where there is some confusion in regard to them, we should have to do so on this principle. If we desired to compel the entire world to keep a regular and logical account of dates, we should have to do so by compelling all the nations to the west of the anti-meridian of Rome to go on reckoning their dates uninterruptedly after they have begun to be reckoned at the said anti-meridian, and by forbidding all the nations to the east of it to reckon any date until it has been reckoned at the anti-meridian of Rome. For this reason I say that the express designation, for the reckoning of universal time, of the meridian of Greenwich or of any other than the anti-meridian of Rome, involves a chronological reform, inasmuch as it will involve the abandonment of the system to which we now adhere, and which we now use by common consent.

This reform will cause a change of nearly 13 hours—that is to say, 12 hours plus the difference of longitude between Rome and Greenwich, if the meridian of Greenwich is designated as the new initial point of the universal date. I do not believe, however, that you will adopt this choice irrevocably, since its curious and strange consequences may be shown by one example, which I will adduce: This table is of about sufficient extent to allow the difference between the geographical longitude of its two ends to be observed and appreciated. Let us suppose that these sessions were held at Greenwich, and that the table were placed east and west, so that the meridian intersected it lengthwise; let us further suppose that we had agreed to reckon the new universal time by this meridian—that is to say, by that of Greenwich—and that, in signing the protocol, we wished to set an example to the world by using the universal date, the present civil date and the future civil date, which, by the daily use of the universal date, the nations will or may finally accept, to the exclusion of all others, for the ordinary purposes of life. Well, now, gentlemen, we should bring our own choice into discredit. We could not sign, according to these three dates. As regards the last, we should find that half the table and half the Congress were under one date, and the other half under another; even our chairman, if seated in the middle, would find that he had been presiding over our sessions with his right side in one day and his left in the next.

I may be told that this would happen, whatever might be the meridian chosen, but we could afford to allow it to happen at sea, or in some isolated and uninhabited region where congresses never sit, and where no ray of civilization ever penetrates.

But to return to the reform, what are you going to do? I will say that if, instead of the meridian of Greenwich, you designate the anti-meridian for the reckoning of universal time and for the initial point of cosmopolitan dates for the present, but for the future as the initial point also of local dates, the reform will amount to about an hour only, but it will still be a reform. In a word, the anti-

meridian of Rome is the one which now furnishes dates to the entire world, and you propose to make the meridian of Greenwich or the anti-meridian do so in future.

I therefore tell you, if you desire a common hour for postal and commercial purposes, designate no meridian at all; let the railway and telegraph companies, the postal authorities and the governments make an arrangement and select an artificial hour, so to speak, whatever it be the hour of Rome, London, Paris, or even that of Greenwich, but do not make a premature declaration which will be an authoritative one as emanating from this Congress, an apparently insignificant reform, but in reality one of very great importance, since, giving the preference to determinate localities in the face of what is scientific, historical, and logical, you render difficult, in the future, the adoption of that very reform, which will, perhaps, then be more necessary, and which can perhaps then be introduced more intelligently.

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You see that I am not speaking in behalf of any special meridian, not even that of Rome, since I admit that the reform may be necessary. You see, and I assure you, that I have not the slightest wish that the meridian which is to be the initial point of universal time should bear the name of any observatory or place in Spain, although that nation discovered the New World in which this Congress is holding its sessions, and although it may be said of that nation that it discovered those very meridians concerning which we are now speaking, inasmuch as terrestrial meridians were indefinite and unknown lines, and were even without form until one was given them by Sebastian Elcano. I therefore hope that if you do not honor my proposition by accepting it, you will at least do justice to my intentions.

Prof. ADAMS, Delegate of Great Britain. Mr. President, I shall be very short in any remarks which I may make upon the proposition before us.

As far as I understand it, it is that, although we have adopted the meridian of Greenwich as a prime meridian from which to count longitudes, we should begin to count our time according to the meridian at Rome. I cannot consent to that proposition. It appears to me to be wanting in every element of simplicity, which should be our chief aim in this Conference. To count longitude from one meridian and time from another, is something that will never be adopted. I do not understand that that was at all the proposition recommended by the Roman Conference. On the contrary, I think that it was quite a different one.

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Mr. RUIZ DEL ARBOL, Delegate of Spain. Mr. President, I do not in reality propose to adopt the meridian or anti-meridian of Rome. What I have been contending for is that we should abstain at present from adopting any meridian as a point of departure for the calculation of time; otherwise, we introduce a new element of confusion for the future. We should change the chronological reckoning which is now in vogue, and I contend that we have no right, scientific or historical, to make that change now. According to my views, the meridian of longitude is relatively an unimportant affair. It is a practical one; it cannot be changed in twenty years, probably, and it will take that time to correct all existing charts. But if you adopt a meridian for time, it will be very difficult to alter it in the future. I cannot now clearly see what the difficulties will be, but I apprehend that the application of this new principle to the various details of scientific and civil matters will necessarily be attended with great inconvenience, and may result in proving to be quite impracticable. I understand it very well that it is proposed to confine this principle to certain subjects, and that it is adopted for the purpose of avoiding dangers in communications, in

navigation, in railways, and in transmitting telegrams, &c.; but this is purely an administrative matter, and can be left for settlement to other bodies.

The PRESIDENT. The Chair would remind the Delegate of Spain, Mr. RUIZ DEL ARBOL, that at its last session the Conference resolved, with singular unanimity, that it was expedient to adopt "a universal day for all purposes for which it may be found convenient, and which shall not interfere with the local or other standard time where desirable." The Chair would politely suggest that the subject now under consideration is the adoption of the proposition recommended by the Conference at Rome, and which has been presented here by the Delegate of Sweden, Count LEWENHAUPT.

Mr. RUIZ DEL ARBOL, Delegate of Spain. My proposition is to abstain from the adoption of any one meridian, and that we leave the matter to some other Congress, organized with the special object of regulating this question.

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Commander SAMPSON, Delegate of the United States. Mr. President, as near as I can follow the Delegate of Spain, he seems to be under the apprehension that by the adoption of the universal day, which has been proposed here, we should either gain or lose time in our chronology; that we should skip 12 hours, more or less. But, of course, that is not the case. Any event which has occurred, or which will occur, at the time of the adoption of the universal day will be expressed just as exactly with reference to time as if the time had been calculated from the beginning of the Christian era. There will not only be no confusion, but it seems to me the adoption of the universal day will tend to avoid confusion hereafter, because confusion must exist where we have so many standards of time. Now, if any event which is taking place, or has taken place at any past time in the history of the world, is referred to the prime meridian, or is expressed in the time of any locality or of several localities, these times will all be different. The adoption of the universal day is to avoid any difficulty of that sort, and any event which has transpired will, when expressed in the time of the universal day—that is, according to the universal method—represent exactly the interval of time which has elapsed since the beginning of the Christian era. Nothing is gained or lost.

General STRACHEY, Delegate of Great Britain. It seems to me that the Congress having accepted the resolution to which reference was made a little while ago, adopting the universal day, it is incumbent upon us, in the nature of things, to determine when that universal day shall begin. The resolution presented by the Delegate of the United States proposes to define how that universal day shall be reckoned; that is, when it shall begin and how its hours shall be counted.

It was explained by him that the difference between his proposition and the proposition made at Rome consisted in altering the time of the commencement of the so-called universal day from noon at Greenwich to the commencement of the civil day. Certainly what Commander SAMPSON just said is perfectly true. The adoption of this so-called universal day will not interfere in the smallest degree with any purpose for which time is employed in civil life. The two objects are entirely distinct. It is obvious that the conception of the necessity of having a universal day has arisen from the more clear conception of the fact that time on the globe is essentially local; that the time upon any given line (supposing it to be a meridian) is not the time at the same moment on either side of that line, however small the departure from it may be; and for scientific accuracy it has, therefore, been thought desirable to have some absolute standard to which days and hours can be referred. Up to the present time it has been the practice to say, in an indefinite way, that an event happened, say, on the 1st of January at 6 o'clock in the morning, and such a statement of the time has been considered sufficient; but, in truth, this does not completely describe a definite epoch of time, for if

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the event occurred at Madrid and was so reported, that report would not designate the same moment as a report of an event which was described to have occurred at precisely the same date and hour at Greenwich, or Rome, or Washington. What is required and desired is that we should have an absolute and definite standard for reckoning events of a certain description, for which complete precision is desirable. I consider, therefore, that the Delegate of Spain leads us astray in the proposition which he has offered, by which he virtually proposes to nullify the resolution already adopted. We have already decided that a universal day was expedient, and it is for the Conference to settle now when that universal day shall begin.

Mr. RUIZ DEL ARBOL, Delegate of Spain. I understand that the consequences, perhaps, would not be troublesome at first; but who can look into the future and say, if we take the meridian of Greenwich as the standard of time, what difficulties we may be driven into? Every country will be obliged to count both ways. They will have to use civil time and universal time. Perhaps all countries may get accustomed to this radical change sooner or later, but we cannot foresee the difficulty now. I have here a treatise (a book) on "Analytic Chronology," showing the rules by which to bring into accord different dates of different calendars and eras, and I do not know how they would be affected by this universal time; but it is unnecessary for me to speak of that, as I think you are acquainted with the subject.

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Mr. JUAN PASTORIN, Delegate of Spain. The Congress has already come to very important decisions on the subject of the reckoning of longitude, and it will also certainly approve to-day those which have just been submitted on the subject of the universal day.

I say certainly, because the result of the former votes being already known, it cannot be doubted on which side the majority will be, and because, from a scientific point of view, having chosen Greenwich as the prime meridian for the calculation of longitude, and having decided to reckon longitude in two directions from zero hours to twenty-four hours, with the sign plus towards the east and minus towards the west, it will be advantageous to make the civil day of Greenwich coincide with the universal day, if we would have an easy formula for passing from local to cosmic time.

So many of the resolutions submitted to the Congress by Mr. RUTHERFURD having been approved one after another, the plan that our colleague has carefully studied will be accepted in its entirety; but it will be impossible for the Conference to know in all their details other plans which, perhaps, would not be less worthy of attention.

Is the resolution adopted by a majority of the Congress the best? Should we reach the end of the reform in complete harmony with the hopes of all the governments represented here? On the contrary hypothesis, it seems to me, that the sessions of this Congress will only be another step towards that reform, but not the reform itself.

If the majority of the Congress, in accordance with the logical consequence of its work, adopts as the cosmic time the civil time of Greenwich, that decision will be contrary to the most ancient ideas of the human race. For many centuries the day has been reckoned as starting from the east, and the world will not easily abandon the traditions of its predecessors.

The civil day of the world commences near the anti-meridian of Rome, Greenwich, or Paris. Therefore it is not natural that one of these meridians should be chosen as the point of departure of dates.

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Really, one phenomenon cannot be the commencement of a series of phenomena if there is another which precedes it periodically.

If the majority, as is logical, adopts the formula, "cosmic time=local time-longitude," and applies in the calculation longitude with the signs plus and minus, according as the longitude is east and west, the system will be source of frequent mistakes, and those, in their turn, will be the cause of disastrous accidents, especially on railroads.

Let us take the 31st of December, for instance. It is three o'clock at a point nine hours east of Greenwich; at the same moment they will count at Greenwich eighteen civil hours of the 30th of the same month, after the actual manner of reckoning the civil day, and that civil time of Greenwich will be the cosmic time.

Apply to the proposed example the formula which I suppose the majority of the Congress will adopt, and the result will be a negative quantity, minus six hours—a result not sufficiently comprehensible in itself, and one that could not be easily applied by the general public.

Can a majority prevail in questions, such as those we are speaking of, simply by the force of numbers? The whole world for several centuries thought that the earth was the centre of our planetary system; in fact, until an insignificant minority rose against this theory, for a long time considered by their ancestors indisputable.

I will conclude by expressing my opinion upon the subject with which the Congress is occupied. My opinion is not new, in spite of its having been modified in the course of our sitting. The works of our eminent colleague and indefatigable propagandist, Mr. SANDFORD FLEMING, the resolution of the Conference at Rome, the valuable opinions of Messrs. Faye, Otto Struve, Beaumont de Bouthiller, Hugo Gylden, the scientific work of Monsieur Chancourtois, and the report which M. Gaspari has just presented to the Academy of Sciences of Paris are the text upon which I base the simplest and most practical method of solving the problem, namely, to adopt as the prime meridian for cosmic time and longitude a meridian near the point at which our dates change, and to reckon longitude from zero hours to twenty-four hours towards the west, contrary to the movement of the earth. The formula would be then: Cosmic time = local time + longitude.

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I think that the best way of finding cosmic time in relation to local time and longitude is to add a quantity to the civil hour of each point of the globe.

But as the majority of this Congress, so worthy of respect, admits no modifications of the system which we may call Greenwich, let us lay aside the question of longitude and consider cosmic time separately.

I have the honor, therefore, to present the following resolutions, and I ask the Congress to consider them, and to accept them as a means of compromise:

I. We agree to choose as the prime meridian for cosmic time that meridian near which the civil day of the world commences, namely, the anti-meridian of Rome, Greenwich, or Havre.

II. The cosmic day consists of twenty-four hours, and commences at midnight of the prime meridian.

III. The earth is divided from the initial meridian into twenty-four hour-spaces, counted in a direction contrary to the movement of the earth from *0h.* to *24h.*

We shall, then, have the following formula: $T = t + R$, where R represents the difference reckoned from *0h.* to *24h.* between the local time of the prime meridian and the local time of each point of the globe; T the Cosmic Time and t the local time.

The PRESIDENT. The Chair would ask the Delegate of Spain, Mr. PASTORIN, whether he offers his resolution as an amendment to that offered by his colleague, Mr. RUIZ DEL ARBOL.

Mr. RUIZ DEL ARBOL, Delegate of Spain. Mr. Chairman, the amendment last offered is not intended to interfere with my proposition.

The PRESIDENT then put the question to the Conference upon the amendment offered by the Delegate of Spain, Mr. RUIZ DEL ARBOL.

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Upon a vote being taken, the amendment was lost.

The PRESIDENT. The question now recurs upon the amendment offered by the Delegate of Spain, Mr. PASTORIN. That amendment runs as follows:

"I. We agree to choose as the prime meridian for cosmic time that meridian near which the civil day of the world commences, namely, the anti-meridian of Greenwich or Havre.

"II. The cosmic day consists of twenty-four hours, and commences at midnight of the prime meridian.

"III. The earth is divided from the initial meridian into twenty-four hour spaces, counted in a direction contrary to the movement of the earth.

"We shall, then, have the following formula: $F = A + R$ where R represents the difference reckoned from *0h.* to *24h.* between the local time of the prime meridian and the local time of each point of the globe; F the cosmic time, and A the local time."

The PRESIDENT. In order that this amendment may be presented more clearly to the Conference, I would propose a recess for a few minutes. If there be no objection, a recess will be taken.

No objection being made, the Conference took a recess.

The PRESIDENT having called the Conference to order stated that, unless further remarks were presented, the vote would be taken upon the resolution offered by the Delegate of Spain, Mr. PASTORIN.

No objection being made, the vote was then taken upon the amendment, and it was lost.

The PRESIDENT. The question now recurs upon the resolution offered by the Delegate of Sweden, Count LEWENHAUPT, which will again be read. The resolution is as follows:

"The Conference recommends as initial point for the universal hour and the cosmic day the mean mid-day of Greenwich, coinciding with the moment of midnight or the beginning of the civil day

Professor ADAMS, Delegate of Great Britain. Mr. President, I intended to speak on the resolution offered by the Delegate of the United States, Mr. RUTHERFURD, but the remarks which I have put together apply equally well to the amendment to that resolution now offered by the Delegate of Sweden, which is identical with one of the recommendations of the Conference at Rome, because, in fact, in my remarks I discuss these propositions alternatively. Therefore, with your permission, I will lay before you the observations which I wish to make.

I beg leave to express my entire approval of the resolution which has been laid before the Conference by Mr. RUTHERFURD. There is only one point involved in the resolution which seems to call for or even to admit of any discussion.

It appears evident that the universal day and date should coincide with the day and date of the initial meridian. The only question, therefore, which we have now to decide is, when shall this day of the initial meridian be considered to commence? And the proper answer to be given to this question does not appear to me in any degree doubtful.

In modern times it is the universal practice to reckon dates by *days* and not by *nights*. The word "day" is used in two different significations, being sometimes applied to the period of daylight and sometimes to the period of 24 hours, including both day and night; but in whichever of these senses the word *day* is employed, the term mid-day has one and the same signification, viz., the instant of noon or of the sun's passage over the meridian. In the present case, where we are concerned with mean time, mid-day means the instant of mean noon, or of the passage of the mean sun over the meridian.

Accordingly, the civil day, by which all the ordinary affairs of life are regulated, begins and ends at midnight, and has its middle or mid-day at noon.

It appears, then, most natural that the universal day should follow this example, and should begin and end at the instant of mean midnight on the initial meridian, and should have its middle at the instant of mean noon on the same meridian.

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I fail, therefore, to see the force of the reasons which induced the Conference at Rome to recommend that the universal day should commence at *noon* on the initial meridian.

The only ground for making this recommendation is that astronomers, instead of adopting the use of the civil day, like the rest of the world, are accustomed to employ a so-called astronomical day, which begins at noon. The advantage thus gained is that they avoid the necessity of changing the date in the course of the night, which is the time of their greatest activity; but this advantage is surely very small when compared with the inconvenience of having two conflicting methods of reckoning dates, and of being obliged to specify, in giving any date, which mode of reckoning is adopted. If this diversity is to disappear, it is plain that it is the astronomers who will have to yield. They are few in number compared with the rest of the world. They are intelligent, and could make the required change without any difficulty, and with very slight or no inconvenience.

The requisite changes in the astronomical and nautical ephemerides would be easily made. As these ephemerides are published several years in advance, there would be plenty of time for navigators to

become familiar with the proposed change in time-reckoning before they were called upon to employ it in their calculations.

I believe that they would soon come to think it more convenient and natural to reckon according to civil time than according to the present astronomical time. I am told that this practice is already universally adopted in keeping the log on board ship. To avoid any chance of mistake, it should be prominently stated on each page of the ephemerides that mean time reckoned from mean *midnight* is kept throughout.

Whether or not astronomers agree to adopt the civil reckoning, I think we ought to adopt the instant of midnight on the initial meridian as the commencement of the universal day.

The relation between the local time at any place and the universal time would then be expressed by the simple formula:

Local time = universal time + longitude.

Whereas, if the proposition of the Roman Conference were adopted, we should have to employ the less simple formula:

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Local time = universal time + longitude - 12 hours.

In recommending the mean noon at Greenwich as the commencement of the universal day and of cosmopolitan dates, the Roman Conference refers to this instant as coinciding with the instant of midnight, or with the commencement of the civil day, under the meridian situated at 12 h. or 180° from Greenwich. Now, this reference to the civil day and date on the meridian opposite to Greenwich appears not only to be unnecessary and to be wanting in simplicity, but it may also lead to ambiguity in the date, as expressed in universal days, unless this ambiguity be avoided by making an arbitrary assumption. No doubt the Greenwich mean noon of January 1 coincides with midnight on the meridian 12 h. from Greenwich, but with what midnight. What shall be its designation and the corresponding date given to the universal day? Shall we call the instant above defined the commencement of the universal day denoted by January 1 or by January 2? Each of these dates has equal claims to be chosen, and the choice between them must clearly be an arbitrary one, and may, therefore, lead to ambiguity.

By adopting Greenwich mean midnight as the commencement of the universal day, bearing the same designation as the corresponding Greenwich civil day, all ambiguity is avoided, and there is no need to refer to the opposite meridian at all.

Those are the ideas I wish to express with regard to the commencement of the universal day.

I may mention in connection with this subject that Professor Valentiner is one of the gentlemen who were invited, a week or two ago, to attend the meetings of this Conference, in order that, if requested, they might express their opinions from a scientific standpoint upon the questions before it; but as Professor Valentiner had to leave Washington before our sessions were at an end, I thought it would be expedient to ask him for his opinion in writing upon the matter which is now pending before this Conference. He has written a letter in German, expressing his opinion. I have caused that letter to be translated into English, and if the Conference allows me I will read it.

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The PRESIDENT. If there be no objection to the proposition of the Delegate of Great Britain the letter will be read.

No objection being made, Professor ADAMS continued: It is well known that Professor Valentiner is an eminent practical astronomer, and I think that any opinion coming from him on this subject, which interests astronomers very much, will be considered of great weight. The letter runs as follows:

CHARLOTTESVILLE, VA.,
October 12th, 1884.

HONORED SIR: You had the kindness to ask me for my views as to the choice of the moment for the beginning of the day. As I cannot remain longer in Washington, I allow myself thus briefly to write to you.

When, as in the present case, the object is to introduce uniformity in the time-reckoning of the astronomical and the civil world, I am of the opinion that it is the astronomer only that must give way. For all purposes of civil life one cannot begin the day in the middle of the day-light—that is to say, in the middle of that interval during which work is prosecuted. In general it appears to me natural that the middle of the day, and not the beginning of the day, should be indicated by the highest position of the sun which governs all civil life. In fact, it would in civil life be simply impossible to bring about a change of date in the middle of the daylight. For the astronomer there certainly exist difficulties. His activity occurs mostly in the civil night, and he, therefore, has to make the change of date in the midst of his observations; and this difficulty is increased, since he almost exclusively observes according to sidereal time, so that often a computation must be made in order to ascertain whether the observations were made before or after the midnight or moment of change of date. However, this difficulty can be overcome by habit, and I believe that scarcely any doubt will occur as soon as a uniformity of expression has established itself through the astronomical world. As regards the ephemerides, we already employ, in fact, the beginning of the date at midnight, since the places of planets and comets, are generally computed for 12 o'clock midnight of Berlin or Greenwich or other places. But these are points that have themselves long since been discussed.

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I scarcely need to say anything further. I would not hesitate for a moment to give the preference to making the change of date take place at midnight, according to civil reckoning, in order to establish a uniformity with the customs of civil life.

It, perhaps, may be important to remark that we could not introduce this change immediately, since the ephemerides are already computed and published for three or four years in advance. It would, therefore, be well to fix the epoch of change of normal dates to some distant time, such as 1890.

I remain, very respectfully yours,

W. VALENTINER.

I may also mention that the practice that prevails among astronomers at the present time of reckoning the day from noon is by no means without exceptions. There are very important astronomical tables which reckon the day from midnight; for instance, in Delambre's Tables of the Sun; in Burg's, Burckhardt's and Damoiseau's Tables of the Moon; in Bouvard's Tables of Jupiter, Saturn, and Uranus, and in Damoiseau's Tables of Jupiter's Satellites, mean midnight is employed as the epoch of the tables. I may also mention that Laplace, in his *Mécanique Celeste*, adopts the

mean midnight of Paris as the origin from which his day is reckoned. Hence there are great authorities, even among astronomers, in favor of commencing the day at midnight.

General STRACHEY, Delegate of Great Britain. Sir, I observe that a very eminent American authority is present in this room, I mean Professor Hilgard. As he was invited to attend the meeting of this Conference, I suggest that the views of the Conference may be taken, whether he may not be invited to express his opinion on the point now under consideration.

The PRESIDENT. With the concurrence of the Conference, the Chair will be most happy to ask Professor Hilgard to do us the favor to give us his opinion upon the question now before the Conference.

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No objection was made to the proposition of the President.

Professor HILGARD arose and said. I thank you and the Conference very much for this invitation, and General STRACHEY for having proposed it to the Conference, but my opinion has been squarely expressed both in French and English in the report of a certain committee, that I am in favor of midnight at Greenwich as the beginning of the universal day, and of longitude being calculated both ways from Greenwich. I really cannot add anything to what has been said in the arguments already presented by Professor ADAMS, and I do not think that I ought to detain this Conference a moment by repeating the opinion he has expressed to all the experts in this matter.

I beg you will excuse me for not further ventilating my views. Absence from the city, I regret, has prevented me from availing myself of the invitation earlier.

Sir FREDERICK EVANS, Delegate of Great Britain. I have the honor to address the Conference once more upon the practical aspect of the subject before us as affecting the large body of navigators. I wish to say upon this point that there appears to me, in the address of my colleague, Professor ADAMS, somewhat of a mixing together of two subjects.

The question immediately before us, as I understand it, is whether the commencement of the universal day shall be midnight or noon of the initial meridian. That is what we practically have to decide. Now, I gather from Professor ADAMS' remarks that upon this question the ephemerides which we now employ have some important bearing. I do not think that that should influence us, for this reason, that the next resolution which will come before the Conference "expresses the hope that as soon as may be practicable the astronomical and nautical days will be arranged everywhere to begin at midnight."

This resolution, so far as I understand it, will be the warning to astronomers to begin to make the changes growing out of this resolution which may be necessary for seamen. Therefore, I consider that we may at once proceed to vote upon the question whether the day is to commence at midnight or noon, without any reference to the practice or interests of navigation. In reality, it does not appear to me to affect that subject at all.

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I have given some consideration to the practical bearings of this question—whether it should be midnight or noon. What we ought to decide is what will be the least inconvenience to the world at large. I have ascertained from two of my colleagues, who have given this matter the greatest consideration, that the adoption of midnight will really cause less confusion than noon, for this reason, that all the great colonies of the world would be less affected; that is to say, that the times

they are using now would be less affected by midnight than by noon. That being so, it appears to me to be an essential point in coming to a settlement of this question.

Mr. RUIZ DEL ARBOL, Delegate of Spain. I have only to say that I have listened to the remarks about navigators changing the reckoning of time. I do not know whether there are many navigators here, but it is a fact that seamen reckon the day from noon.

The PRESIDENT. I beg the pardon of the Delegate of Spain; but, in the United States navy, we reckon the day from midnight.

Mr. RUIZ DEL ARBOL, Delegate of Spain. I am speaking generally. Now, there is some reason for this rule among seamen, for the only way to find out the position of a ship is to observe the meridian altitude of the sun; and everybody requires to know, at sea, what has taken place in the course of every day, from the beginning to the last moment of the day; and I think that whatever the rule may be in the United States navy, navigators generally will count their time as they count it now.

I think that navigators will not change the rule now in force, no matter what we may adopt in this Conference.

Commander SAMPSON, Delegate of the United States. I think, Mr. President and gentlemen, that the change to the adoption of the universal day, beginning at midnight, would be a very decided advantage to navigators. The quantities as now given in the nautical ephemerides are for noon of the meridian for which they are computed, as Washington, Greenwich, &c. It is very evident that every navigator, in making use of the quantities given in the nautical almanac, must find the corresponding time at Greenwich, wherever he may be on the surface of the earth. Consequently, if we suppose that navigators are pretty equally distributed, one-half on one side of the earth and one-half on the other side, the Greenwich day for one portion would be the local night for the other.

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The usual observations made by navigators at sea consist in a meridian observation of the sun for latitude, and a morning and possibly afternoon observation of the sun near the prime vertical for longitude. Consequently all navigators, when in the vicinity of the initial meridian, might have their day's work occurring in two astronomical days. On the other hand, those navigators who were in the neighborhood of the 180th meridian would have all their work of one day occurring in the same astronomical day. The first would have the advantage of interpolating for short intervals only, while the second would be obliged to interpolate for much larger intervals.

Consequently, on the whole, it would make no difference to navigators whether the quantities given in the nautical almanacs were for noon or midnight of the initial meridian. Another consideration, however, would make it very advantageous to have the quantities given for midnight. That consideration is this: if midnight were chosen, then the universal day would be identical with the nautical almanac day, and navigators would have only ship time and universal time to deal with, while, if the quantities were given for noon, they would have astronomical time, in addition to the other two. This consideration I think a very important one.

The PRESIDENT. The question will be on the amendment offered by the Delegate of Sweden, Count LEWENHAUPT, which has been read.

The vote was then taken, as follows:

States voting in the affirmative:

Austria,	Sweden,
Italy,	Switzerland,
Netherlands,	Turkey.

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In the negative:

Brazil,	Japan,
Chili,	Liberia,
Colombia,	Mexico,
Costa Rica,	Paraguay,
Great Britain,	Russia,
Guatemala,	United States,
Hawaii,	Venezuela.

Abstaining from voting:

France,	San Domingo,
Germany,	Spain.

Ayes, 6; noes, 14; abstaining from voting, 4.

The PRESIDENT then announced that the amendment was lost.

The question then recurred on the original resolution offered by the Delegate of the United States.

RUSTEM EFFENDI, Delegate of Turkey. Mr. President, I have listened with a great deal of interest and attention to the learned arguments bearing upon the proposition under discussion offered by the Hon. Mr. RUTHERFURD, the Delegate of the United States for the adoption of a universal hour.

This question is of such high importance, and of such interest to every one, that I consider it my duty to make a few remarks upon the subject, as I wish to state clearly the position my government proposes to take in the matter.

I do not pretend to discuss scientifically this subject, which has already been so ably treated by several of the gentlemen present. My task is of a different and inferior order. I merely propose to briefly examine the manner in which the proposition ought to be made, in order that it may be adopted by our respective governments.

The question of a universal hour is not of equal interest and importance to all. The United States of America, although comparatively a young nation, have done so much in the pursuit of science and scientific investigation that they must have more than a common interest on the subject. The vast expanse of their country, stretching over sixty degrees of longitude, with a difference of time of more than four hours, almost compels them to adopt a universal hour. The thousands of miles of railroad tracts covering this continent, facilitating the intercourse between distant places, necessitate a uniform system to avoid confusion. It was, therefore, natural that the United States and Canada should have taken the lead in proposing such a reform, which would likewise benefit other countries, as, for instance, the British Empire, Russia, and Germany. But there are, at the same time, other countries, like France, Spain, Italy, Scandinavia, etc., that may content themselves with a national hour, owing to the small difference in time within their dominion. For them, the

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adoption of a universal hour would only be of secondary importance, because it would only affect their international relations.

I hope I may be permitted to remind you of the conclusions arrived at by a commission consisting of scientists, railroad and telegraph officials, &c., appointed by the French Government to express their opinion upon this subject. If I am not mistaken, they recommended a universal hour, stating, however, at the same time, that the benefit to be derived from such an hour would be only of secondary importance for their country. The learned Delegate from France, Professor JANSSEN, will probably be kind enough to inform us whether I am right or not.

The few remarks I have made bring me to the point I wanted to consider more specially. I mean that the originators of the pending proposition, and those directly interested in it, should be induced to modify their proposition somewhat if they wish it to be adopted by other countries. In other words, to leave to each country the greatest latitude possible in adopting a universal hour.

With regard to the Ottoman Empire, I must state that it is placed in a somewhat exceptional position in this respect, and is, therefore, obliged to ask for more latitude even than the other countries concerned.

In our country we have two modes of reckoning time: one from noon to noon, or from midnight to midnight, as everywhere else, (*heure à la franque*), the other (*heure à la turque*) from sundown to sundown. In this latter case the hours count from the moment when the disk of the sun is bisected by the horizon, and we count twice from *0h.* to *12h.*, instead of counting without any interruption from *0h.* to *24h.* We are well aware of the inconveniences this system of counting produces, because *0h.* necessarily varies from day to day, for the interval of time between one sunset and the one following is not exactly 24 hours. According to the season the sun will set earlier or later, and our watches and clocks at Constantinople will be at most about three minutes fast or slow from day to day, according to the season.

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Reasons of a national and religious character prevent us, however, from abandoning this mode of counting our time. The majority of our population is agricultural, working in the fields, and prefer to count to sunset; besides, the hours for the Moslem prayers are counted from sundown to sundown.

Therefore it is impossible for us to abandon our old system of time, although in our navy we generally use the customary reckoning or "*heure à la franque*."

Finally, permit me to state that I am ready to cast my vote in favor of a universal hour, with the precise understanding that the universal hour will have to be limited to international transactions, and that will not interfere with the rules up to now in force in my own country.

Before resuming my seat I wish to thank the President and the members of the Conference for their kind indulgence in having listened to my remarks.

The PRESIDENT, The Chair would remind the Delegate of Turkey that the following resolution was passed at our last session:

"Resolved, That the Conference propose the adoption of a universal day for all purposes for which it may be found convenient, and which shall not interfere with the use of local or other standard time where desirable."

The very difficulty which the Delegate of Turkey anticipates was thus carefully provided for in the resolution just read.

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Mr. SANDFORD FLEMING, Delegate of Great Britain. To my mind it is of very great importance that this resolution should be adopted. I have already given generally my views on this question, and therefore I do not intend to trespass on the attention of the Conference beyond saying a very few words. From what I have already ventured to submit, it will be obvious that I hold that all our usages in respect to the reckoning of time are arbitrary. Of one thing there can be no doubt. There is only one, and there can only be one flow of time, although our inherited usages have given us a chaotic number of arbitrary reckonings of this one conception. There can be no doubt of another matter; the progress of civilization requires a simple and more rational system than we now have. We have, it seems to me, reached a stage when a unification of the infinite number of time-reckonings is demanded.

This unification will be, to a large extent, accomplished if the resolution be adopted, and by adopting it, it seems to me to be in the power of the Conference to confer lasting benefits on the world.

Universal time will in no way interfere with local time. Each separate community may continue the usages of the past in respect to local time, or may accept whatever change the peculiar conditions in each case may call for. But the use of universal time will not necessarily involve a change; it will rather be something added to what all now possess. It will be a boon to those who avail themselves of it.

To the east of the prime meridian all possible local days will be in advance; to the west all possible days will be behind the universal day.

The universal day, as defined by the resolution, will at once be the mean of all possible local days, and the standard to which they will all be related by a certain known interval, that interval being determined by the longitude.

In my judgment, the resolution is an exceedingly proper one, and the Conference will act wisely in passing it.

The PRESIDENT. In taking the vote upon the resolution, it is requested that the roll be called.

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The following States voted in the affirmative:

Brazil,	Liberia,
Chili,	Mexico,
Colombia,	Netherlands,
Costa Rica,	Paraguay,
Great Britain,	Turkey,
Guatemala,	United States,
<u>Hawaii,</u>	Venezuela.
Japan,	

States voting in the negative:

Austria-Hungary,	Spain.
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Abstaining from voting:

France,	San Domingo,
Germany,	Sweden,
Italy,	Switzerland.
Netherlands,	

Ayes, 15; noes, 2; abstained, 7.

The PRESIDENT then announced that the resolution was passed.

Mr. RUTHERFURD, Delegate of the United States. Mr. President, I now present for the consideration of the Conference the following resolution:

"Resolved, That the Conference expresses the hope that as soon as may be practicable the astronomical and nautical days will be arranged everywhere to begin at midnight."

Before action is taken upon this resolution, I would make a verbal correction. I think that the word "*mean*" ought to be introduced before the word "*midnight*" and I therefore alter my resolution in that way.

The vote was then taken upon the resolution just offered, and it was carried without division.

The PRESIDENT. The Chair begs leave to state that the protocols in French and in English of the first and second sessions of the Conference, have been examined, and are now before the Conference for adoption. If any Delegate wishes to make any correction in these protocols, he can submit it to the Conference, and, if approved, it can be immediately made.

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No objection was raised, and the President put the question to the Conference on the adoption of the protocols of the first and second sessions in French and English, and they were unanimously adopted.

M. JANSSEN, Delegate of France. Mr. President, we have been directed to present for the approval of the Congress the desire that studies relative to the application of the decimal system to the division of angular space and of time should be resumed in order that this application may be extended to all cases—and they are numerous and important—where it presents real advantages.

I would say that a similar desire upon the same subject was expressed by the Conference at Rome.

You are aware, gentlemen, that at the time of the establishment of the metrical system the decimal division had been extended to the measurement of angular space and of time. Numerous instruments were even made according to the new system. As to time, the reform was introduced too abruptly, and, we might say, without enough discretion, and it came into conflict with old habits and was quickly abandoned; but as to the division of angular space, in which the decimal division presented many advantages, the reform sustained itself much better, and is still used for certain purposes. So, the division of the circumference into 400 parts was adopted by Laplace, and we find it constantly employed in the *Mécanique Celeste*. Delambre and Mechain used, for the measurement of the arc of the meridian from which the metre was derived, repeating circles divided into "*grades*." Finally, in our own time, Colonel Perrier, Chief of the Geographical Division of our Department of War, has used instruments decimally divided, and at the present time logarithmic tables appropriate to that method of division are in course of calculation.

But it is especially when it is a question of making long calculations of angular space that the decimal system presents great advantages. In this respect we find, so to speak, only one opinion expressed by scientists.

The Conference at Rome, which brought together so many astronomers, geodetists, eminent topographers—that is to say, the men most competent and most interested in the question—expressed in respect to it a desire, the high authority of which it is impossible to mistake.

It is, therefore, now evident that the decimal system, which has already done such good service in the measurements of length, volume, and weight, is called upon to render analagous services in the domain of angular dimensions and of time.

I know that this question of the decimal division encounters legitimate doubts, principally as to its application to the measurement of time. It is feared that we want to destroy habits fixed for centuries, and upset established usages.

In this respect, gentlemen, I think that we ought to be fully satisfied. The teachings of the past will be respected. It will be perceived that if we failed at the time of the Revolution, it is because we put forward a reform which was not limited to the domain of science, but which did violence to the habits of daily life. It is necessary to take the question up again, but with due regard to the limits which common sense and experience would prescribe to wise and well-informed men.

I think that the character of the reform would be well defined by saying that it is intended especially to make a new effort towards the application of the decimal system in scientific matters.

But, gentlemen, I have not to discuss here the bearing of the reforms which the study of this question will lead to. It is sufficient for me to show that there is in that direction an indispensable step to be made, and to ask you to express the desire that the question should be studied. I do not think that there is anybody here who would desire to oppose a request which does not in truth commit us to any specific solution of the question, and which appears so opportune at the present time. I would ask the President to be so kind as to submit the following proposition to the Conference:

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"Resolved, That the Conference expresses the hope that the studies designed to regulate and extend the application of the decimal system to the division of angular space and of time shall be resumed, so as to permit the extension of this application to all cases where it presents real advantages."

The PRESIDENT. The Chair is of opinion that the Conference was called for a special and somewhat narrow purpose, and the consideration of the decimal system, proposed by the Delegate of France, seems to it foreign to that purpose and beyond the scope of the Conference. The President, however, simply acts for the Conference, and if the Conference shall decide to take the matter up, he will acquiesce, but it strikes the Chair that the resolution is out of order.

Gen. STRACHEY, Delegate of Great Britain. Sir, I desire to express my personal views on this subject. I should be very happy to join the Delegate of France in voting for such a resolution, but I fear that there is a feeling among many of the delegates that it is not within our competence to discuss it. If that is so, I would suggest whether it might not be better that it should not be pressed to a vote. It would be a pity if there should be on the records of the proceedings of this Conference anything in the shape of a vote against the subject-matter of this resolution. I consequently think

that if delegates have formed any decided opinion on the subject, they might express their opinion without voting; but I repeat that it would be a great pity if a negative vote should be taken on the subject of the decimal system of dividing the circle and time, particularly as it was received with unanimity in the Conference at Rome.

Prof. ADAMS, Delegate of Great Britain. Mr. President, I may say that while I agree with Gen. STRACHEY in thinking that I should not like to vote against the proposition brought forward by our eminent colleague, Mr. JANSSEN, yet I feel it is somewhat beyond the scope of the subjects which we have to discuss, and, therefore, I should abstain from voting. I quite recognize that, for certain purposes, the decimal division of the circle is very valuable.

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The PRESIDENT. Unless the Conference decides to entertain this proposition, the Chair suggests that no discussion shall take place. If any member present desires to bring the matter up, he can do so by taking an appeal from the decision just made.

Gen. STRACHEY, Delegate of Great Britain. Do I understand, sir, that the subject is dropped?

The PRESIDENT. The Chair has decided that the resolution offered by the Delegate of France is out of order, and unless a difference of opinion is expressed by the Conference, the subject will be dropped. The Chair wishes to treat with the most distinguished deference the Delegate of France, because we are all most happy to do honor to him in every way. Does the Chair understand that the Delegate of France appeals from its decision, and wishes to take the sense of the Conference upon it?

Mr. JANSSEN, Delegate of France, replied in the affirmative.

Commodore FRANKLIN, Delegate of Colombia. Mr. President, I would like hear the resolution read again. If it be merely a suggestion to consider the subject of the decimal system, I should like to know it.

The vote was then taken upon the appeal of the Delegate of France from the decision of the Chair.

States voting in favor of the appeal:

Austria-Hungary,	Netherlands,
Brazil,	San Domingo,
Chili,	Spain,
France,	Switzerland,
Italy,	Turkey,
Japan,	Venezuela.
Mexico,	

States voting against the appeal:

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Colombia,	Hawaii,
Costa Rica,	Liberia,
Germany,	Paraguay,
Great Britain,	United States.
Guatemala,	

Abstaining from voting:

Ayes, 13; noes, 9; abstained, 2.

The PRESIDENT. The appeal from the decision of the Chair is sustained, and the proposition offered by the Delegate of France is now before the Conference. If no delegate wishes to speak upon the resolution, the vote will be taken.

Mr. JANSSEN, Delegate of France. Mr. President, before the definitive vote I desire to again call my colleague's attention to the fact that it is a question here of the much-needed extension of the decimal system, an extension desired by a large number of the highest scientific authorities and of the most distinguished observers. As I said only a moment ago, the Congress at Rome, whose high authority in the matters which have occupied us is acknowledged, was a still higher authority as to astronomy, geodesy, topography; that is to say, in the domain to which our proposition relates. At Rome a wish, similar to that which we ask you to formulate, was expressed. Besides, if we observe that it is a question here only of expressing the desire that studies should be resumed upon the matter in question, is there anyone among us who would wish to oppose the liberal proposition which prejudices nothing in the solution of the question, but which will surely lead to important progress. I do not doubt, then, that all our colleagues will desire to unite in a resolution, which by its object and by the manner in which it is expressed, ought, it appears to me, to unite the suffrages of all.

No further remarks were made upon the resolution, and the vote was accordingly taken on the question whether it should be adopted.

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States voting in the affirmative:

Austria-Hungary,	Mexico,
Brazil,	Netherlands,
Chili,	Paraguay,
Colombia,	Russia,
Costa Rica,	San Domingo,
France,	Spain,
Great Britain,	Switzerland,
Hawaii,	Turkey,
Italy,	United States,
Japan,	Venezuela.
Liberia,	

States voting in the negative: None.

Abstained from voting:

Germany,	Sweden.
Guatemala,	

Ayes, 21; noes, 0; abstained, 3.

The PRESIDENT. The resolution of the Delegate of France is, therefore, adopted.

General STRACHEY, Delegate of Great Britain. Sir, before concluding the session to-day, I hope that the Delegates will be in a position to listen to the two resolutions which I now desire to propose,

and which I think will tend to clear up a good deal of the discussion which we have had. The first of these resolutions is as follows:

"The Conference adopts the opinion that, for the purposes of civil life, it will be convenient to reckon time, according to the local civil time at successive meridians distributed round the earth, at time-intervals of either ten minutes, or some integral multiple of ten minutes, from the prime meridian; but that the application of this principle be left to the various nations or communities concerned by it."

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This resolution, as it stands, embraces all the practical suggestions which have been made on the subject up to the present time. The only limitation it proposes to put upon the adoption of what may be called local standard time is that the breaks shall be at definite intervals of ten minutes or more.

The second resolution which I propose is a very simple one. It is this:

"The arrangements for adopting the universal day in international telegraphy should be left for the consideration of the international telegraph congress."

There has been established by an international arrangement a congress which meets every two years to settle questions of international telegraphy, and I think that the precise manner in which universal time may be adapted to telegraphy would very properly be left to that congress.

Mr. DE STRUVE, Delegate of Russia. On behalf of the Delegates of Russia, I beg to make the following remarks:

We have already expressed the opinion that the universal time could be properly used for international postal, railway, and telegraphic communications. But it is to be understood that local or any other standard time, which is intimately connected with daily life, will necessarily be used side by side with the universal time.

It has been proposed, in order to establish an easier connection between local and universal time, to accept twenty-four meridians at equal distances of 1 hour or 15°, or to divide the whole circumference of the earth by meridians at distances of 10 minutes of time or 2½°.

This question not yet having been made the subject of special and thorough investigation by the respective Governments, and not having been discussed at the International Conference at Rome, we believe that it would as yet be difficult to express, in regard to Europe, any positive opinion on the practical convenience of the above mentioned or other possible methods of dividing the globe into equal time-zones.

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We would suggest to recommend that the system of counting the hours of the universal day from 0 to 24, which probably will be adopted for the universal day, might also be introduced for counting the local time side by side with the old method of counting the hours of 0 to 12 A. M. and 0 to 12 p. m.

Count LEWENHAUPT, Delegate of Sweden. I have had the honor to transmit to the members of the Conference a résumé of a report on this subject made by Professor Gylden, an eminent Swedish astronomer, whose name, no doubt, is familiar to many of the Delegates. The system proposed by Mr. Gylden is similar to the one now proposed by the Delegate for Great Britain. The only difference is that Mr. Gylden, in explaining the system, recommends the adoption of equidistant meridians, separated by intervals of 2½°, or 10 minutes of time, while the proposition of the

Delegate for Great Britain is so worded that this distance may be greater than 10 minutes. This difference is, however, only a question of detail. The basis of Mr. Gyldén's system is that time meridians should be separated from the standard initial meridian by either 10 or some integral multiple of 10 minutes. Therefore, I shall, with pleasure, vote for the resolution of the Delegate from Great Britain.

I beg only permission of the Conference to insert Mr. Gyldén's report as part of my remarks:

RÉSUMÉ OF A REPORT read before the Swedish Geographical Society by Hugo Gyldén, Professor of Astronomy and member of the Academy of Sciences in Stockholm, concerning the use of Equidistant Meridians for the fixation of the Hour.

If we suppose the meridian passing through the Observatory of Greenwich extended round the globe, this grand circle will cut the equator, at 180° from Greenwich, at some place a little east of New Zealand. This meridian falls almost entirely in the Ocean, and cuts, in any case, not more than a few small islands in the Pacific. If we suppose, further, another great circle at 90° from the meridian of Greenwich, the western half touches very nearly New Orleans, and the eastern half passes a few minutes from Calcutta. If, now, the hour is fixed according to these four meridians, we have four cardinal times—one European, one American, one Asiatic, and one Oceanic.

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It will, however, be necessary to fix much more than one civil time for Europe. Therefore I suppose for Europe a whole system of meridians, which, however, ought not to be closer together than 2½°. The difference of time between these meridians is then only 10 minutes, which, in general, can be considered as an insignificant difference between the civil and the true solar time. The starting point of this system is the meridian of Greenwich. To the west the system ought to extend 30 minutes; to the east 2½ hours, or to a meridian passing near Moscow.

I suppose as time zero the meridian of Greenwich. The next meridian to the east is meridian 1. This meridian will not pass far from the Observatory of Paris, because the difference between this meridian 1 and the meridian of Paris is only 40 seconds, an insignificant difference in civil life. The meridian 1 can be called the meridian of Paris, or French meridian.

The second meridian (to the east of Greenwich) does not touch Utrecht, but will pass so close that the time of this city could, without the least inconvenience, be regulated as if the difference of time between Greenwich and Utrecht were exactly 20 minutes. The second meridian would also pass almost as close to Amsterdam, (22s.,) and would not be far from Marseilles, (1m. 29s.) In the vicinity of the third meridian we have, first, Bern, (16s.;) next, a little further, Turin, (42s.) The fourth meridian is close to Hamburg, Altona, and Gottingen, (respectively 6s. and 14s.) Not far from the same meridian is Christiania, although at a distance of a little over 2 minutes. The fifth meridian passes also close to three large cities—Rome, (5s.,) Leipzig, (26s.,) and Copenhagen, (20s.)

The sixth meridian does not touch any city of importance, but it coincides very nearly with the meridian adopted for the normal civil time in Sweden; the difference amounts only to 15 seconds.

The seventh meridian touches the little town of Brieg, in the vicinity of Breslau, and Königsberg is situated two minutes from the eighth. The ninth meridian passes less than one minute to the west of Abo, and is situated at a distance of only a few seconds from Mistra, a town in Greece. The tenth meridian almost touches Helsingfors in Finland. As regards the eleventh meridian, I have not been able to find any locality of importance exactly so situated that it merits a place in this list, but I can, however, mention the cities of Minsk and Jassy. The twelfth meridian is situated 1m. 14s. to the west of the Academy of Sciences, in St. Petersburg, and the distance

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from Kiew is about the same. It is not necessary to continue the enumeration of the other meridians to the east by intervals of 10 minutes, but I will mention that Moscow is situated 2*h.* 30*m.* 17*s.* to the east of Greenwich, and in consequence the system would be convenient with regard to this city.

If we pass to the west of Greenwich, we will find that the first meridian west touches the little town of Almeria, in the south of Spain, which country extends to equal distances on both sides of this meridian, east and west, and the situation of Portugal is the same with regard to the third meridian west.

Then, in all the towns and localities given above, of which the greater part are of some importance, the local time coincides so closely with times differing from the Greenwich time, by whole multiples of 10 minutes, that there is no reason to fear any real inconvenience if these times were taken to regulate local reckonings. If the different countries in Europe should decide to adopt the system which I have explained, the following system of normal times would, perhaps, be found convenient:

EAST OF GREENWICH.

1st	Meridian,	France.
2d	"	Holland and Belgium.
3d	"	Switzerland.
4th	"	Norway, (and Western Germany.)
5th	"	Denmark, Germany, and Italy.
6th	"	Sweden and Austria.
7th	"	Eastern Germany.
8th	"	Hungary.
9th	"	Poland and Greece.
10th	"	Finland, Roumania, and Bulgaria.
11th	"	European Turkey.
12th	"	Western Russia.

WEST OF GREENWICH.

1st	Meridian,	Spain.
3d	"	Portugal.

It is, however, not at all necessary that each country should adopt a single civil time for the whole of its territory. If several normal times should be adopted, it is still possible to use the system, provided only the several times differ from Greenwich time by 10 minutes, 20 minutes, &c.; but it would be necessary that the clocks should indicate the times adopted with great precision, and that the difference did not amount to even a few seconds, because otherwise the advantages of the adoption of the system would be materially reduced.

This circumstance, that it is possible for each country to adopt the system, and at the same time to maintain a certain independence with regard to the adoption of the most convenient normal times, is of considerable importance with regard to the possibility of introducing a system of this kind. In fact, it is possible to arrive at the application of the system in such a way that the transition would hardly be observed by the great majority of the population. As regards railroads and telegraphs, the advantages would be the same as if the local times were everywhere identical, because it is easy to remember the multiple of 10 minutes which ought to be added to the time of a given country for translation into the time of another country. The difference of time between Sweden and Denmark would, for instance, be 10 minutes—a circumstance which everybody would soon learn to remember. A traveller leaving Sweden would then know that his watch, if correct, shows exactly 10 minutes more than the clocks of the Danish railroad stations,

and if he continued his voyage to Paris, he would know that the clocks of Paris are exactly 50 minutes behind the clocks in Sweden.

I have tried to explain the advantages of this system for the countries in Europe. I am not able to judge if similar systems can be considered necessary in America and Asia. It is possible that North America could be satisfied with one single normal time, which, if America connects this time with the European system, ought to be fixed exactly 6 hours behind Greenwich. While starting from this normal meridian, it is possible to establish a more or less elaborate system of equidistant times analogous to the system which has been proposed for Europe. The same can be said of the civil times of Asia, which ought to be connected with a normal time 6 hours in advance of the time of Greenwich.

Africa ought to belong to the European system. The French civil time could be adopted for Algeria and Tunis; the time of Denmark, Germany, and Italy for Tripoli; for Egypt the time of Russia; the Spanish time for Morocco; at the mouth of the Congo where, no doubt, sooner or later, an important centre of civilization will rise, the meridian of Sweden and Austria could be used; the meridian of Hungary could be adopted for the Cape of Good Hope.

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It will not be possible to connect South America and Australia with any of the four cardinal times mentioned, but some other combination, into which it is not necessary to enter on this occasion, can easily be found.

The PRESIDENT. If the Chair hears no objection, the pamphlet referred by the Delegate of Sweden will be printed as proposed.

Mr. LEFAIVRE, Delegate of France. Mr. President, I move that the Conference adjourn until Wednesday, at one o'clock p. m.

The motion was put and agreed to, and the Conference thereupon adjourned at 4:30 p. m. until Wednesday, the 22d inst., at one o'clock p. m.

VII.

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SESSION OF OCTOBER 22, 1884.

The Conference met pursuant to adjournment in the Diplomatic Hall of the Department of State, at one o'clock p. m.

Present:

Austria-Hungary: Baron IGNATZ VON SCHÆFFER.

Brazil: Dr. LUIZ CRULS.

Chili: Mr. F. Y. GORMAS and Mr. A. B. TUPPER.

Colombia: Commodore S. E. FRANKLIN.

Costa Rica: Mr. JUAN FRANCISCO ECHEVERRIA.

France: Mr. A. LEFAIVRE, Mr. JANSSEN.

Germany: Baron H. VON ALVENSLEBEN, Mr. HINCKELDEYN.

Great Britain: Sir F. J. O. EVANS, Prof. J. C. ADAMS,

Lieut.-General STRACHEY, Mr. SANDFORD FLEMING.

Guatemala: Mr. MILES BOOK.

Hawaii: Hon. W. D. ALEXANDER, Hon. LUTHER AHOLO.
Italy: Count ALBERT DE FORESTA.
Japan: Professor KIKUCHI.
Liberia: Mr. WM. COPPINGER.
Mexico: Mr. LEANDRO FERNANDEZ, Mr. ANGEL ANGUIANO.
Netherlands: Mr. G. DE WECKHERLIN.
Paraguay: Capt. JOHN STEWART.
Russia: Mr. C. DE STRUVE, Major-General STEBNITZKI, Mr.
J. DE KOLOGRIVOFF.
San Domingo: Mr. DE J. GALVAN.
Spain: Mr. JUAN VALERA, Mr. EMILIO RUIZ DEL ARBOL,
and Mr. JUAN PASTORIN.
Sweden: Count CARL LEWENHAUPT.
Switzerland: Col. EMILE FREY.
Turkey: RUSTEM EFFENDI.
United States: Rear-Admiral C. R. P. RODGERS, Mr. LEWIS
M. RUTHERFURD, Mr. W. F. ALLEN, Commander W. T.
SAMPSON, Professor CLEVELAND ABBE.
Venezuela: Dr. A. M. SOTELDO.

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Absent:

Denmark: Mr. C. S. A. DE BILLE.
Salvador: Mr. ANTONIO BATRES.

The PRESIDENT. The first business before the Conference to-day is the resolutions offered by the Delegate of Great Britain, General STRACHEY; but before we proceed the Delegate of San Domingo, Mr. GALVAN, asks permission, as a matter of privilege, to read a communication to the Conference.

Mr. GALVAN, the Delegate of San Domingo. Before the sessions of the Conference come to a close, I feel compelled to make a declaration which will be a tribute to the illustrious scientists who have directed the decisions of the majority of the Conference, and at the same time a reservation of future freedom of action to the country which I have the honor to represent.

The negative vote of San Domingo on the principal question was entirely in consequence of the proposal by the Delegates of France of a neutral International Meridian, which was rejected by the Conference.

San Domingo, which had no part in the various important interests connected with the meridian of Greenwich, was bound to regard equity alone on the occurrence of the disagreement produced by the proposal of the Delegates of France, a nation renowned for being one of the first in intellectual progress.

At the last session I was glad that another proposal of the Delegates of France was accepted almost unanimously by the Conference. That fact should be considered as a good omen of a more complete and unanimous agreement at some future time in behalf of the general interest of science.

That day will be saluted with a cordial *hosanna* by the Republic of San Domingo, which is always ready freely to give its assent to the progress of civilization.

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The PRESIDENT. The resolutions offered by the Delegate of Great Britain, General STRACHEY, are now before the Conference, and will be read.

The resolutions were then read, as follows:

"1. The Conference adopts the opinion that, for the purposes of civil life, it will be convenient to reckon time according to the local civil time at successive meridians distributed round the earth, at time-intervals of either ten minutes, or some integral multiple of ten minutes, from the prime meridian; but that the application of this principle be left to the various nations or communities concerned by it."

"2. The arrangements for the use of the universal day in international telegraphy should be left for the consideration of the International Telegraph Congress."

General STRACHEY, Delegate of Great Britain. In consequence of the opinions I have heard expressed regarding the resolutions which I brought forward at our last meeting, I feel constrained to say that I am not disposed to ask the Congress to proceed to a vote upon them. I find that, although I had reason to think that those resolutions, in substance, that is in their main features, would be acceptable, still there is extreme difficulty in finding precise expressions that shall meet the views of everybody, and there are divisions of opinion as to the exact manner in which these resolutions should be modified.

My object in bringing forward the resolutions was mainly to obtain a decided expression of opinion on the part of the Congress, that the method of counting local time, so as to harmonize as far as possible with universal time, should be left for settlement locally; and that, at the utmost, all the Congress could do would be to suggest some general principle such as that embodied in my resolution. There was, of course, never any intention of employing the universal day so as to interfere with the use of local standard time; and as I shall, no doubt, elicit a further clear expression of opinion on the part of the delegates, that there is no intention of bringing about this interference, I will now, with the permission of the Conference, withdraw the resolutions.

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Mr. RUTHERFURD, Delegate of the United States. Mr. President, I think that all of us appreciate the desire which moved the Delegate of Great Britain to present these resolutions. There is a wish on his part that we should not seem, in any way, by our action here, to interfere with the convenience of the world in the use of its present civil time, or any other time which it may be found convenient to adopt, while he recognizes that some of the proposals made as to local time are such as could not be objected to. Still, I cannot refrain from expressing my satisfaction that he has come to the conclusion that these resolutions are not necessary.

I think the whole question is covered by the resolutions already adopted by this Congress; that our universal day is for those purposes only for which it may be found convenient, and that it is not to interfere in any way with the use of civil or other standard time where that may be found convenient. This seems to me to be so fully embodied in our resolutions that it is unnecessary to enunciate again in a negative form the same idea, and I therefore express my satisfaction that the resolutions are withdrawn.

Mr. SANDFORD FLEMING, Delegate of Great Britain. Mr. President, I have a few words bearing on the subject before the Conference which I wish to express before any action is taken.

The PRESIDENT. There will be no subject before the Congress if the resolutions of General STRACHEY are withdrawn, and the Chair understands that the object of General STRACHEY in withdrawing these resolutions was to avoid a discussion upon a subject that could hardly lead to any satisfactory conclusion.

If, however, Mr. FLEMING desires to address the Conference, he will be at liberty to do so.

Mr. FLEMING, Delegate of Great Britain. I do not wish to intrude any new matter upon the Conference. What I had to say had a bearing upon the subject, but, if the resolutions are withdrawn and the Conference desires to end the matter, I shall not insist upon speaking.

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No objection being made, the resolutions offered by General STRACHEY at the last session of the Conference were then withdrawn.

Count LEWENHAUPT, Delegate for Sweden, then proposed that the resolutions passed by the Conference should be formally recorded in a Final Act, stating the votes on each resolution that was adopted.

The Conference took a recess, in order to allow the Delegates to examine the draft of the Final Act.

After the recess the Final Act was unanimously adopted, as follows:

FINAL ACT.

The President of the United States of America, in pursuance of a special provision of Congress, having extended to the Governments of all nations in diplomatic relations with his own, an invitation to send Delegates to meet Delegates from the United States in the city of Washington on the first of October, 1884, for the purpose of discussing, and, if possible, fixing upon a meridian proper to be employed as a common zero of longitude and standard of time-reckoning throughout the whole world, this International Meridian Conference assembled at the time and place designated; and, after careful and patient discussion, has passed the following resolutions:

I.

"That it is the opinion of this Congress that it is desirable to adopt a single prime meridian for all nations, in place of the multiplicity of initial meridians which now exist."

This resolution was unanimously adopted.

II.

"That the Conference proposes to the Governments here represented the adoption of the meridian passing through the centre of the transit instrument at the Observatory of Greenwich as the initial meridian for longitude."

The above resolution was adopted by the following vote:

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In the affirmative:

Austria-Hungary,	Mexico,
Chili,	Netherlands,
Colombia,	Paraguay,
Costa Rica,	Russia,
Germany,	Salvador,
Great Britain,	Spain,

Guatemala,	Sweden,
Hawaii,	Switzerland,
Italy,	Turkey,
Japan,	United States,
Liberia,	Venezuela.

In the negative:

San Domingo.

Abstaining from voting:

Brazil,	France.
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Ayes, 22; noes, 1; abstaining, 2.

III.

"That from this meridian longitude shall be counted in two directions up to 180 degrees, east longitude being plus and west longitude minus."

This resolution was adopted by the following vote:

In the affirmative:

Chili,	Liberia,
Colombia,	Mexico,
Costa Rica,	Paraguay,
Great Britain,	Russia,
Guatemala,	Salvador,
Hawaii,	United States,
Japan,	Venezuela.

In the negative:

Italy,	Sweden,
Netherlands,	Switzerland.
Spain,	

Abstaining from voting:

Austria-Hungary,	Germany,
Brazil,	San Domingo,
France,	Turkey.

Ayes, 14; noes, 5; abstaining, 6.

IV.

"That the Conference proposes the adoption of a universal day for all purposes for which it may be found convenient, and which shall not interfere with the use of local or other standard time where desirable."

This resolution was adopted by the following vote:

In the affirmative:

Austria-Hungary,	Mexico,
Brazil,	Netherlands,

Chili,	Paraguay,
Colombia,	Russia,
Costa Rica,	Salvador,
France,	Spain,
Great Britain,	Sweden,
Guatemala,	Switzerland,
Hawaii,	Turkey,
Italy,	United States,
Japan,	Venezuela.
Liberia,	

Abstaining from voting:

Germany,	San Domingo.
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Ayes, 23; abstaining, 2.

V.

"That this universal day is to be a mean solar day; is to begin for all the world at the moment of mean midnight of the initial meridian, coinciding with the beginning of the civil day and date of that meridian; and is to be counted from zero up to twenty-four hours."

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This resolution was adopted by the following vote:

In the affirmative:

Brazil,	Liberia,
Chili,	Mexico,
Colombia,	Paraguay,
Costa Rica,	Russia,
Great Britain,	Turkey,
Guatemala,	United States,
Hawaii,	Venezuela.
Japan,	

In the negative:

Austria-Hungary,	Spain.
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Abstaining from voting:

France,	San Domingo,
Germany,	Sweden,
Italy,	Switzerland.
Netherlands,	

Ayes, 15; noes, 2; abstaining, 7.

VI.

"That the Conference expresses the hope that as soon as may be practicable the astronomical and nautical days will be arranged everywhere to begin at mean midnight."

This resolution was carried without division.

VII.

"That the Conference expresses the hope that the technical studies designed to regulate and extend the application of the decimal system to the division of angular space and of time shall be resumed, so as to permit the extension of this application to all cases in which it presents real advantages."

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The motion was adopted by the following vote:

In the affirmative:

Austria-Hungary,	Mexico
Brazil,	Netherlands,
Chili,	Paraguay,
Colombia,	Russia,
Costa Rica,	San Domingo,
France,	Spain,
Great Britain,	Turkey,
Hawaii,	United States,
Italy,	Venezuela.
Japan,	

Abstaining from voting:

Germany,	Sweden.
Guatemala,	

Ayes, 21; abstaining, 3.

Done at Washington, the 22d of October, 1884.

C. R. P. RODGERS,
President.

R. STRACHEY, J. JANSSEN, L. CRULS,
Secretaries.

The following resolution was then adopted unanimously:

"That a copy of the resolutions passed by this Conference shall be communicated to the Government of the United States of America, at whose instance and within whose territory the Conference has been convened."

Mr. RUTHERFURD, Delegate of the United States, then presented the following resolution:

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"*Resolved*, That the Conference adjourn, to meet upon the call of the President, for the purpose of verifying the protocols."

This resolution was then unanimously carried, and the Conference adjourned at half past three, to meet upon the call of the President.

VIII.

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SESSION OF NOVEMBER 1, 1884.

The Conference met at the call of the President for the approval of the protocols, as arranged at the last meeting, in the Diplomatic Hall of the Department of State, at 1 o'clock p. m.

The PRESIDENT having called the Conference to order, said: The protocols in French and English, having been examined by the Secretaries of the Conference, have been submitted to all of the delegates for perusal. If any delegate should desire to make any observation on them the opportunity is now given for his doing so.

RUSTEM EFFENDI, Delegate of Turkey, stated that he desired to change his vote on the fifth resolution of the Final Act, providing for the commencement of the universal day, from the affirmative to the negative.

No objection being made, the change was ordered to be made.

The PRESIDENT then said: No further observations having been made on the protocols, they will now be signed by the Secretaries and the President.

Mr. DE STRUVE, Delegate of Russia. Before the Conference terminates, I beg to express, in the name of my colleagues, our sincere gratitude for the hospitality extended to the Conference by the Government of the United States, and I beg to express our heartiest thanks to you, Mr. President, for the able and impartial manner in which you have presided over our deliberations. When we elected you, we unanimously elected the first Delegate of the United States. If we had to begin again, the personal feelings of all the delegates would supply powerful additional reasons for making the election equally unanimous.

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Mr. DE STRUVE's observation met with the unanimous approval of the Delegates.

The PRESIDENT. Gentlemen, I am greatly honored by the kind expression of your good feeling towards me as the President of this Conference, and I thank you very heartily for it. The duty assigned to us all has not been free from difficulty, but our meetings and discussions have been characterized by great courtesy and kindness, and by a conciliatory spirit.

With patience and devotion the Delegates to this Congress have sought to discharge the trust committed to them, and, as your Chairman, I beg you to receive my most cordial thanks for the courteous consideration I have received at your hands. The President of the United States and the Secretary of State desire me to renew to you their thanks for your presence here, and their best wishes for your safe and happy return each to his own home.

I shall esteem myself very happy hereafter whenever I shall have the good fortune to meet any of my colleagues of the International Meridian Conference.

Mr. RUTHERFURD, the Delegate of the United States. Mr. President and gentlemen, I am sure that you will all unite with me in passing the resolution which I now propose to read:

"Resolved, That the thanks of the Conference be presented to the Secretaries for the able manner in which they have discharged their arduous duties."

The resolution was unanimously adopted.

General STRACHEY, Delegate of Great Britain. I wish, sir, as one of the Secretaries, to express my thanks for the manner in which my labors have been esteemed by the delegates present. All that I

can say on the subject is, that however troublesome the duties of the Secretaries have been, I have not the least doubt that anybody else named instead of myself would equally have bestowed his best attention on the discharge of those duties.

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Mr. JANSSEN, Delegate of France, then said: Before the dissolution of the Conference, Mr. CRULS and I desire specially to thank our colleagues for the honor they have done us by entrusting to us the revision of the French version of the protocols. In order that we might fully respond to that honor, we have examined with all possible care the French translations of the remarks of our colleagues. Our only regret is that, in consequence of the desire of several of them to quit Washington, we have been obliged to leave portions of the translations, particularly of the last protocols, much in the state in which we received them from the official translators, not having had the time to correct these translations as we would have desired.

Upon motion of Mr. JANSSEN, Delegate of France, the Conference passed a vote of thanks to the delegate of Turkey for the aid he has rendered the Secretaries in the revision of the protocols.

The PRESIDENT then said: Before our final adjournment I desire to express a very high appreciation of the ability, fidelity, and zeal with which Mr. W. F. PEDDRICK, the Secretary attached by the Department of State to this Conference, has performed his difficult duties, and to thank him for his services.

The Conference expressed its cordial assent to these observations.

The PRESIDENT then declared that the business of the Conference having been concluded, it would adjourn *sine die*.

C. R. P. RODGERS,
President.

R. STRACHEY, J. JANSSEN, L. CRULS,
Secretaries.

ANNEX I.

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AN ACT to authorize the President of the United States to call an International Conference to fix on and recommend for universal adoption a common prime meridian, to be used in the reckoning of longitude and in the regulation of time throughout the world.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the President of the United States be authorized and requested to extend to the governments of all nations in diplomatic relations with our own an invitation to appoint delegates to meet delegates from the United States in the city of Washington, at such time as he may see fit to designate, for the purpose of fixing upon a meridian proper to be employed as a common zero of longitude and standard of time-reckoning throughout the globe, and that the President be authorized to appoint delegates, not exceeding three in number, to represent the United States in such International Conference.

Approved August 3, 1882.

ANNEX II.

AN ACT making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and eighty-five, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the following sums be, and the same are hereby, appropriated for the objects hereinafter expressed for the fiscal year ending June thirtieth, eighteen hundred and eighty-five, namely:

Under the State Department:

For expenses of the International Conference for fixing a common zero of longitude and standard of time-reckoning, including cost of printing and translations, to be expended under the direction of the Secretary of State, five thousand dollars; and the President is hereby authorized to appoint two delegates to represent the United States at said International Conference, in addition to the number authorized by the act approved August third, eighteen hundred and eighty-two, and who shall serve without compensation.

Approved July 7, 1884.

ANNEX III.

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Circular.]

DEPARTMENT OF STATE
WASHINGTON, *October 23, 1882.*

SIR: On the 3d of August last the President approved an act of Congress, in the following words:

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the President of the United States be authorized and requested to extend to the governments of all nations in diplomatic relations with our own an invitation to appoint delegates to meet delegates from the United States in the city of Washington, at such time as he may see fit to designate, for the purpose of fixing upon a meridian proper to be employed as a common zero of longitude and standard of time-reckoning throughout the globe, and that the President be authorized to appoint delegates, not exceeding three in number, to represent the United States in such international conference."

It may be well to state that, in the absence of a common and accepted standard for the computation of time for other than astronomical purposes, embarrassments are experienced in the ordinary affairs of modern commerce; that this embarrassment is especially felt since the extension of telegraphic and railway communications has joined States and continents possessing independent and widely separated meridional standards of time; that the subject of a common meridian has been for several years past discussed in this country and in Europe by commercial and scientific bodies, and the need of a general agreement upon a single standard recognized; and that, in recent

European conferences especially, favor was shown to the suggestion that, as the United States possesses the greatest longitudinal extension of any country traversed by railway and telegraph lines, the initiatory measures for holding an international convention to consider so important a subject should be taken by this Government.

The President, while convinced of the good to flow eventually from the adoption of a common time unit, applicable throughout the globe, thinks, however, that the effort now to be made should be to reach by consultation a conclusion as to the advisability of assembling an International Congress with the object of finally adopting a common meridian. He, therefore, abstains from extending an invitation for a meeting at an assigned day, until he has ascertained the views of the leading Governments of the world as to whether such International Conference is deemed desirable.

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I am accordingly directed by the President to request you to bring the matter to the attention of the Government of —, through the Minister of Foreign Affairs, with a view to learning whether its appreciation of the benefits to accrue to the intimate intercourse of civilized peoples from the consideration and adoption of the suggested common standard of time so far coincides with that of this Government as to lead it to accept an invitation to participate in an International Conference at a date to be designated in the near future.

You may leave a copy of this instruction with the Minister for Foreign Affairs, and request the views of his Government thereon, at as early a day as may be conveniently practicable.

I am, sir, your obedient servant,

FRED'K T. FRELINGHUYSEN.

ANNEX IV.

Circular.]

DEPARTMENT OF STATE,
WASHINGTON, *December 1, 1883.*

SIR: By a circular instruction of October 23, 1882, you were made acquainted with (the language of) an act of Congress, approved August 3, 1882, authorizing and requesting the President to extend to other Governments an invitation to appoint delegates to meet in the city of Washington for the purpose of fixing upon a meridian proper to be employed as a common zero of longitude and standard of time-reckoning throughout the world; and you were instructed to bring the matter to the attention of the Government to which you are accredited and to inform it that the President deemed it advisable to abstain from the issuance of the formal invitation contemplated, until through preliminary consultation the views of the leading governments of the world as to the desirability of holding such an International Conference could be ascertained.

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In the year that has since elapsed this Government has received from most of those in diplomatic relations with the United States the approval of the project, while many have in terms signified their acceptance and even named their delegates.

Besides this generally favorable reception of the suggestion so put forth, interest in the proposed reform has been shown by the Geographical Conference held at Rome in October last, which very decisively expressed its opinion in favor of the adoption of the meridian of Greenwich as the common zero of time longitude, and adjourned, leaving the discussion and final adoption of this or other equivalent unit, and the framing of practical rules for such adoption, to the International Conference to be held at Washington.

The President therefore thinks the time has come to call the Convention referred to in my instruction of October 23, 1882. I am accordingly directed by the President to instruct you to tender to the Government of ——, through its Minister for Foreign Affairs, an invitation to be represented by one or more delegates (not exceeding three) to meet delegates from the United States and other nations in an international Conference to be held in the city of Washington on the first day of October next, 1884, for the purpose of discussing and, if possible, fixing upon a meridian proper to be employed as a common zero of longitude and standard of time-reckoning throughout the globe.

You will seek the earliest convenient occasion to bring this invitation to the attention of the Minister of Foreign Affairs of —— by handing him a copy hereof and requesting that the answer of his Government may be made known to you.

I am, sir, your obedient servant,

FRED'K T. FRELINGHUYSEN.

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