INSTRUCTIONS

RELATING TO THE WORK
OF THE

UNITED STATES GEOLOGICAL SURVEY

TO TAKE EFFECT

MAY 1, 1903

UNITED STATES GEOLOGICAL SURVEY

CHARLES D. WALCOTT, DIRECTOR

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WASHINGTON

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CONTENTS.

LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
Washington, D. C., January 23, 1903.

SIR: A new edition of the Survey manual of "Regulations," approved by the Secretary of the Interior, is in press. That manual covers the more important matters relating to the general administrative work of the Survey. The committee on regulations submits herewith the draft of a companion manual entitled "Instructions," which relates to details of a less important and more temporary character than the subjects treated in "Regulations." If these instructions meet with your approval, the committee recommends that they be printed for distribution among the members of the Survey.

Very respectfully,

H. C. RIZER,
Chairman of Committee on Regulations.

Hon. CHARLES D. WALCOTT,
Director of Geological Survey.

Approved January 24, 1903.

Chas. D. Walcott,
Director.

INSTRUCTIONS

RELATING TO THE WORK OF THE

UNITED STATES GEOLOGICAL SURVEY.

INTRODUCTION.

On March 3, 1900, a series of instructions relating to the work of the topographic branch of the Geological Survey was approved and published in pamphlet form. The extensive use of this publication by those engaged in topographic work and others exhausted the first edition and seemed to justify its enlargement so that it would cover the field and office work of the Survey generally. The instructions now published have been adopted after full consultation and consideration, so that they may be regarded as embodying the latest and best information on the various subjects treated. They should be carefully studied by the members of the Geological Survey, as a strict compliance with all the provisions is expected. These "Instructions" are supplementary to the manual of "Regulations," third edition, 1903.

GENERAL INSTRUCTIONS.

1. General Organization.

1. The general organization of the Geological Survey is given on the next page in the form of a table, showing the different branches, divisions, and sections, and indicating to whom the chiefs of the various divisions and sections report.

Branch.	Division.	Section.	Chief of division or section reports to—
Administrative	Executive	Correspondence and records.	Chief clerk.
		Supplies	Chief clerk.
		Shipments	Chief clerk.
		Documents	Chief clerk.
		Instruments	Topographic committee.
	Disbursements and accounts.		Director.
	Library		Director.
Publication	Editorial	Texts	Director.
		Geologic maps	Geologist in charge geology.
		Topographic maps	Director.
		Illustrations	Director.
		Photography	Director.
	Engraving and printing.		Director.
Geologic	Geology and paleontology.	Areal geology	Geologist in charge geology.
		Pleistocene geology	Geologist in charge geology.
		Pre-Cambrian and metamorphic geology.	Geologist in charge geology.
		Petrology	Geologist in charge geology.
		Economic geology of metalliferous ores.	Geologist in charge geology.
		Economic geology of nonmetalliferous minerals.	Geologist in charge geology.
		Paleontology	Geologist in charge geology.
	Mining and mineral resources.		Director.
	Physics and chemistry.	Physics	Geologist in charge physics and chemistry.
		Chemistry	Geologist in charge physics and chemistry.
Topographic	Topography	Atlantic	Director.
		Central	Director.
		Rocky Mountain	Director.
		Pacific	Director.
		Triangulation and computing.	Topographic committee.
	Geography and forestry.		Director.
Hydrographic	Hydrography	Eastern	Hydrographer.
		Western	Hydrographer.
	Hydrology	Eastern	Hydrographer.
		Western	Hydrographer.
	Reclamation service.	16 arid States and Territories.	Chief engineer.

2. Correspondence.

1. Letters prepared for the signature of the Director or the chief clerk should be initialed as follows: In the upper left-hand corner the typewritten initials of the division or section chief to whom the reply should be referred; in the upper right-hand corner the typewritten initials of the person doing the typewriting; at the end of the letter, to the left and below the signature of the Director or chief clerk, the pen-written initials of the chief of the division or section in which the letter originates; if the letter is prepared by some one designated by the chief, the former's pen-written initials should appear just below those of the chief.

2. For official correspondence the address should be "Sir:", "Sirs:", or "Madam:", as the case may be, and the signature should be preceded by "Very respectfully,".

3. When letters are referred they should receive prompt action; if a reply is required it should be drafted and sent to the Director or chief clerk for signature without any unnecessary delay. If letters have a subreference they should be returned immediately after action through the official to whom they were originally referred.

4. Referred letters pertaining to the business of the administrative branch will be returned to the section of correspondence and records for recording and filing. Letters referred to chiefs of divisions or sections in other branches will be recorded and filed in those divisions or sections; they will be recorded in the section of correspondence before they are referred.

5. Letters for the Director's signature must reach him not later than 2 o'clock p. m.; they should therefore be received by the chief clerk not later than 1.45; otherwise, unless especially urgent, they will not be signed until the next day, and should be dated accordingly.

6. Material for the National Museum, Smithsonian Institution, or for employees of the Survey located therein, to be transmitted by the wagon or otherwise, must be accompanied by an explanatory letter or a memorandum and pass through the chief clerk.

7. Field men, whether regularly or temporarily employed, should confine their official correspondence to matters relating to the work immediately in hand. All general inquiries or communications should be referred to the Washington office. It is not expected that employees of the Survey, whether in the office or in the field, will attempt to diffuse information obtained; on the contrary, it must be borne in mind that the information is obtained for publication or for communication only to their official superiors.

3. Library.

1. No publication can he drawn from the library until a receipt for it has been signed.

2. The period during which publications may be retained is variable and depends upon the exigencies of each case. They should be returned as soon as the immediate requirements are met and should not be kept for possible future reference.

3. Cyclopedias, atlases, and other books of reference can not be drawn from the library.

4. Publications belonging to the library must not be taken out of the District of Columbia except by permission of the librarian. In case permission is granted, the publications should be consulted and returned to the librarian as soon as possible.

5. Before leaving the city for an extended absence every person should return all publications in his possession which belong to the library.

4. Manuscript and Proof.

1. Typewritten manuscript, carefully revised by the author, makes the best "copy." The sheets should be of uniform size, and the writing should be on only one side of the sheet.

2. Authors should provide their papers with a series of concise and well-graded headings. To every manuscript should be prefixed a complete table of contents, and, if the paper is to be illustrated, a list of illustrations (the latter in duplicate, one copy for the editor and one for the chief of the section of illustrations).

The table of contents should consist of the headings appearing throughout the paper, and the relative rank of the headings should be carefully indicated in the contents by indention. The list of illustrations should not consist of full descriptions, but of brief titles; complete titles and descriptions should be inserted in the manuscript at the proper places. The author should classify his illustrations into "plates" (with roman numbers) and text "figures" (with arabic numbers); but whether an illustration can, all things considered, be better treated as a plate or as a text figure must be determined finally in the office of the Survey. After classifying them into the two groups, he should arrange and number each group in the order in which the illustrations are to appear in the paper, and should note on the list, by pages of manuscript, where he desires the illustrations to be placed. At the appropriate place or places in the text reference should be made to every illustration by its number. Failure on the part of an author to observe these simple rules relating to the table of contents and the illustrations may result in doubt concerning the relative rank he intends the various sections of the paper to hold, or concerning the proper location or order of some of the illustrations.

3. Responsibility for the accuracy of references and quotations must rest upon the author; they will not, in general, be verified in the editorial section of the Survey. In reprinting extracts the precise orthography, the punctuation, and the grammatical errors of the original are not to be preserved at the cost of clearness and consistency, except in the case (1) of extracts in which quaintness of form is intentionally preserved, and (2) of citations in discussions of a controversial character.

4. Titles of books and papers cited should be put in footnotes, not in the text. A series of publications like those of the Geological Survey should exhibit uniformity in footnotes as well as in other typographic details, and therefore authors should give careful attention to the form as well as the accuracy of footnotes. Below are examples showing the abbreviations, capitalization, and order of items which have been adopted by the Survey for footnotes. Authors are requested to follow these, and to treat

other cases analogously, in papers written for publication by the Survey.

Van Hise, C. R., The iron-ore deposits of the Lake Superior region: Twenty-first Ann. Rept. U. S. Geol. Survey, pt. 3, 1901, p. 318.

Dutton, C. E., Tertiary history of the Grand Canyon district: Mon. U. S. Geol. Survey, vol. 2, 1882, p. 63.

Diller, J. S., and Patton, H. B., The geology and petrography of Crater Lake National Park: Prof. Paper U. S. Geol. Survey No. 3, 1902, p. 26.

Peale, A. C., Mineral springs of the United States: Bull. U. S. Geol. Survey No. 32, 1886, p. 20.

Wilson, H. M., Pumping water for irrigation: Water-Sup. and Irr. Paper No. 1, U. S. Geol. Survey, 1896, p. 55.

Weeks, J. D., The manufacture of coke: Mineral Resources U. S. for 1886, U. S. Geol. Survey, 1887, p. 104.

Alden, W. C., Description of the Chicago district: Geologic Atlas U. S., folio 81, U. S. Geol. Survey, 1902, p. 2.

Dana, J. D., Volcanic eruptions of Hawaii: Am. Jour. Sci., 2d ser., vol. 10, 1850, p. 235.

Gueymard, É., Mémoire sur le platine des Alpes: Bull. Soc. géol. France, 2d ser., vol. 12, 1855, p. 429.

Polis, A., Ueber aromatische Bleiverbindungen: Ber. Deutsch. chem. Gesell., 20 Jahrgang, No. 18, 1887, p. 3331.

Am. Geologist.
Am. Naturalist.
Bull. Dept. Geol. Univ. California.
Bull. Geol. Soc. America.
Bull. Mus. Comp. Zool. Harvard Coll.
Bull. Philos. Soc. Washington.
Jahrbuch K.-k geol. Reichsanstalt.
Jour. Geol.
Nat. Geog. Mag.
U. S. Geog. Surv. W. 100th Mer.
U. S. Geog. and Geol. Surv. Rocky Mt. Region.
U. S. Geol. and Geog. Surv. Terr.
U. S. Geol. Explor. 40th Par
Zeitschr. anal. Chemie.

5. In the spelling of geographic names preference should be given as follows: Decisions of the United States Board on Geographic Names, Geological Survey atlas sheets (latest editions), Century Atlas of the World and Century Cyclopedia of Names, Lippincott's Gazetteer of the World, Rand, McNally & Co.'s Atlas.

6. Use the hyphen in specific rock names—i. e., the names of definite rock types; but when the first word has an adjective sense, and the meaning would not be changed if an adjective were

used (e. g., clay slate=argillaceous slate), the words should not be joined. Examples: mica-schist, hornblende-gneiss, tuff-breccia; (but) andesite breccia, greenstone conglomerate, sand rock.

7. Every table should have a concise heading.

8. In mentioning authors or other persons concerning whose identity there is possibility of doubt, a writer should give, along with the surname, the initials; they may be needed by the indexer at least.

9. In what is known as printer's or publisher's "style" (spelling, abbreviation, capitalization, etc.) the preferences of authors are extremely diverse and must be largely disregarded for the sake of system and symmetry in the publications of the Survey. The law makes it the duty of the Public Printer to determine the forms and style of the public printing and binding, and therefore the Survey conforms, with few exceptions, to the rules laid down in the Manual of Style Governing Composition and Proof Reading in the Government Printing Office, copies of which authors and typewriters can obtain through the editor of the Survey. A few of these rules, with slight changes, are here given:

Follow Webster's International Dictionary in spelling, compounding, etc. Observe, however, the form of the following words:

acre-foot
aluminum
arrastre
asbestos
backward
badlands
base-level
can not
canyon
cerussite
clue
court-house
cross section
débris
downward
draft
employee
eolian
esker
farther (distance)
forward
further (other than distance)
gage
Gasteropoda
groundmass
head-gate
headwaters
horsepower
Jones's (possessive)
laccolith
perlite
poikilitic
post-office
Professor (with surname only)
Prof. (with full name)
reconnaissance
second-foot
upward
volcanism
vug
wasteway
watercourse
waterworks
5 by (not x) 10 inches.

Follow Postal-Guide contractions for States and Territories (except Oregon, for which use Oreg.) after names of post-offices, counties, forts, barracks, arsenals, navy-yards, naval stations, military or Indian reservations, and Indian agencies.

Capitalize "river," "bay," "cape," "harbor," "mount," "island," etc. (singular form only), when used with the proper name.

Capitalize "state" and "territory," both singular and plural, when referring to administrative divisions; also "county" and "township" (singular form only) when used with the proper name.

Distances, weights, measures, dimensions, and percentages should be put in figures. For fuller instructions regarding use of figures see the Manual of Style.

Compound adjectives take the hyphen: A 2-foot rule, 10-horsepower engine, 16-candlepower light, 6-hundredweight load, many-colored coat, light-armed soldier, asked-for opinion, fine-grained wood, light-green color, etc.

The words "well," "so," and "ill" will be used as follows: He is an ill-tempered man; he is very ill tempered. Well-meant intentions; his intentions are well meant. His so-called poem; his poem (so called) is, etc. But generally adverbs are not compounded with adjectives which they qualify: A divinely inspired book; a finely modeled statue; a nicely kept lawn.

"St." will be used for Saint, but Fort and Mount will not be abbreviated.

Abbreviate section, township, range, etc., thus: SE. ¼ sec. 5, T. 9 N., R. 2 E.

Italicize names of genera and species (not higher groups), except in tables and indexes. Words and phrases in foreign languages will be printed in roman.

10. Galley proof will be submitted to the author; also the page proof when practicable. A Department regulation requires of authors well-prepared manuscript and prohibits extensive changes in proof, and the Public Printer regards it as his duty to refuse to expend public funds by making such changes. Reasonable emendation may be made on galley proofs, but not radical alterations, and on page proofs no material changes will be permitted. If an author makes changes in his proof exceeding this limit, either they will be disregarded or work on his paper will be discontinued.

5. Illustrations.

1. The direction in "Regulations" to transmit all material for illustrations to the Director does not preclude previous direct consultation between the author and the chief of the section of illustrations, but the latter will not take up anything for preparation until it has been officially transmitted.

2. The letter of transmittal should state (*a*) the title of the paper to which the illustrations pertain; (*b*) the length (estimated) of the paper, in printed pages; (*c*) the total number of plates and of text figures that the paper will contain.

3. Single originals or groups thereof involving special labor may be transmitted in advance of the bulk of the material; otherwise all the material for a paper should be transmitted together. If parts are transmitted at different times, the later transmittals should make reference to the previous ones.

4. A list of illustrations should accompany each lot of material transmitted. It should consist of brief titles with numbers (roman for plates, arabic for text figures) showing proper sequence, and *reference to manuscript page* should be given for each illustration.

5. Every original drawing should be as complete as the author can make it, and should be accompanied by full explanation in writing, for the draftsman's guidance. It should bear on its margin: (*a*) the list number; (*b*) the brief title given in the list; (*c*) a succinct statement of what features the illustration is designed to show, i. e., what the author expects the reader to see in it; (*d*) if intended for a plate, an indication whether, in the author's judgment, it should be made a single-page plate, double-page plate, folding plate, or folding pocket map.

6. An author intending to submit maps for illustration of reports will consult the custodian of base maps in the section of illustrations. In case no suitable base map is available he will make application through his division or section chief to the committee on base maps for the preparation of such a base. The cost of the compilation and drawing in case of contoured maps of intermediate scales will be borne by the division issuing the report, the work being done under the direction of the above-named committee. Small-scale outline base maps will be prepared in the section of illustrations.

7. All illustrations when completed will be submitted to the author for approval, and *at that time only* will alterations be permitted, unless they are the result of new information. An approval stamp will appear on each illustration, which the author

will sign after indicating such corrections as he may deem necessary.

8. Proofs of illustrations will be forwarded to authors when they can be reached without causing too great a delay. An approval stamp for the author's signature will appear on the proofs, which should be examined and returned at once.

9. The chief of the section of illustrations is charged with the custody of all original cuts of illustrations. Geologists and others who desire the use of these cuts in official publications should give reference to published volume, title, and plate or figure number. Requests for electrotypes should be made to the Director.

6. Photography.

1. Members of the Survey making use of the camera in the field are expected, unless they are already skilled photographers, to avail themselves of all the means at their command, both those afforded by the Survey and those available elsewhere, for becoming proficient in the use of the camera. A course of instruction by means of demonstrations and lectures will be given at the Survey at the beginning of each field season, and the chief photographer will at all times be ready to give supplementary instruction to anyone who may desire it. Dark-room facilities and instruction in developing will be furnished to those wishing to familiarize themselves with this branch of the art. No one should go into the field without some practical experience with the particular camera and plates which he expects to use, nor should old or defective plates or films be used in the field.

2. The use of photographic material supplied by the Survey should be confined strictly to objects germane to the work of the Survey. In case a member of the Survey uses in his official work private photographic instruments or material, all resulting negatives which may be of value to the Survey for illustration or other purposes will be regarded as Survey property, the same as other field collections.

3. All cameras and other photographic apparatus will be in the custody of the chief photographer, who will see that they are in

thorough repair before they are taken into the field. All apparatus should be turned over to the custodian for examination and repair (if needed) immediately on the return of field parties. Requisitions for the purchase of photographic apparatus and supplies must be approved by the chief photographer, and persons making such requisitions are recommended to consult him in advance, in order that the outfit purchased may be adapted to the particular conditions under which it is to be used. For the same reason instruments should be purchased in the field only under conditions of exceptional emergency.

4. Every negative sent to the Survey laboratory for developing, or developed elsewhere at the Survey's expense, must be numbered and be accompanied by a record, made at the time of exposure, having a corresponding number. This record should state the conditions under which the exposure was made, the nature of the subject, and any further information which will assist the photographer in developing. Books containing suitable blanks for making this record will be supplied by the office. No negatives will be developed in the Survey laboratory hereafter unless accompanied by such a memorandum. In case one part of the picture is of more importance than another the fact should be noted for the guidance of the developer; also, the special importance of particular negatives, duplicate exposures, parts of panorama, etc. This field record should contain all the information required for the permanent index label, for which it will be used after the negative is developed and proved.

5. When negatives are submitted to the laboratory for developing, a definite procedure will be followed, involving cooperation between the author and the photographer:

(*a*) After developing, with special reference to the information furnished by the author, an unmounted proof will be made of each negative which shows any definite image.

(*b*) With the negatives and a set of proof prints the photographer will consult the author, who is requested to indicate any negatives which are of exceptional importance for illustration purposes. These the photographer is instructed to improve, if possible, by retouching, intensifying, or other means.

(*c*) After an examination of the proof prints, the author is requested to select such negatives as should be retained by the Survey. He will trim, number, and label the prints of the selected negatives and return them to the laboratory, where they will be suitably preserved and form the index to the Survey collection. Each author will have a consecutive series of numbers and should supply a full descriptive label for each negative. Authors are urged to reject poor negatives unless they are of exceptional importance, in order that the Survey collection may be kept within reasonable limits.

(*d*) Greater care in developing negatives will generally be taken in the Survey laboratory than elsewhere, and work will usually be done there with promptness, so that negatives should be sent to the Survey laboratory for developing unless there are exceptionally urgent reasons for doing otherwise. Proofs printed elsewhere at the Survey's expense are subject to the regulations provided in *b* and *c*.

6. All official negatives, both films and plates, suitable for illustration or other Survey purposes must be properly numbered, supplied with descriptive label, and deposited in the photographic laboratory as soon as possible. This applies to negatives now in the hands of authors as well as those hereafter developed in the Survey laboratory and elsewhere at the Survey's expense. Requisitions for prints or slides will not be filed until the regulation is complied with.

7. When the negatives are properly catalogued mounted prints may be ordered, the negatives being designated by number. Authors are urged to confine orders for prints to their actual needs. Since the negatives are to be readily accessible, it will be unnecessary and undesirable to have more prints made than are needed at the time, in order to provide against uncertain future contingencies. When a view is definitely decided upon for reproduction several prints of varying intensity may be procured from which a selection can be made. In general, from one to three prints will supply ordinary requirements, and when more are ordered the object for which they are to be used should be fully stated.

8. Authors may retain the proof prints from negatives which for

any reason it is not considered desirable to add to the Survey collection, and an additional print may be ordered from such negatives when needed for a specific purpose. Requests for prints from negatives not included in the Survey collection must be accompanied with the negatives from which they are to be made.

9. Negatives smaller than 3¼ by 4¼ inches will be developed in the Survey laboratory and prints made, at the discretion of the chief photographer, when other work of the laboratory will not be thereby delayed. Such small negatives may be developed in the field and at the expense of the allotment of the person taking them. Regulation 2, above, applies to these smaller cameras as well as to larger ones. The number of prints ordered at official expense must be limited strictly to the requirements of the official work of the Survey.

10. No work of any kind will be done in the Survey photographic laboratory except on a regularly approved requisition. In case an author desires prints for other than official use he will be permitted to withdraw from the Survey collection, for a limited time, the negative taken by himself, leaving a receipt for the same; but in no instance will he be allowed to intensify, reduce, or retouch the negative. All work of this character must be performed in the photographic section. The author may give his order for prints to the photographer with whom arrangements are made for filling private orders. With prints are included lantern slides.

11. The Survey collection of lantern slides is growing so rapidly that it promises soon to become inconveniently large. The material included in it will hereafter be subjected to more careful scrutiny, and several classes of material will be excluded. Slides will not be made in the Survey laboratory from inferior negatives unless the subjects are of exceptional importance; they will not be made from subjects of ephemeral interest unless the purpose for which they are to be used is one closely connected with the furthering of the Survey's interests, and then the requisition should indicate that they are not intended to be included in the Survey collection; they will not be made from private negatives or maps unless the subjects are of exceptional general interest and therefore especially desirable for the Survey collection.

12. Hereafter slides will be catalogued as soon as finished, and the person on whose requisition they are made may draw them from the collection, giving a receipt, under regulations already provided.

7. Documents.

1. Survey publications (books, maps, geologic and topographic folios) required for temporary consultation by employees should be drawn from the library.

2. When such publications are desired for a more extended official use, they should be applied for through the document section, on general requisition Form 9–125, and should be returned when no longer needed.

3. Distribution of documents to persons not members of the Geological Survey must be made through the document section on an approved request.

4. The author of a report, if not a sale publication, may receive 20 copies for personal disposition; and if stock be not too low an additional number, not to exceed 100 copies, may be distributed by authors, through the document section, among persons residing in the region to which the report pertains or persons specially interested in the subject.

8. Instruments and Records.

INSTRUMENTS.

1. Requisitions for instruments to be issued by the custodian must be made on Form 9–125 and be approved by the administrative officer directly in charge. Lists of instruments to be returned to the custodian must be made on the special form provided for that purpose.

2. Receipts will be given by heads of parties, who will be held personally responsible for the instruments receipted for until the same have been delivered to the custodian or accounted for by transfer receipts.

3. When instruments are transferred from one person to another, the transferee will receipt to the transferrer and will notify the custodian of such transfer. A double postal card (Form 9–139) has been provided for such transfers.

4. It is expected that care will be taken in handling Survey instruments. All persons using them will be held personally responsible for them, and will be required to replace or repair loss or injuries resulting from carelessness. A special written report should be submitted in explanation of serious damage.

5. When in cases of emergency instruments or bench marks are ordered from the field, bills should be sent directly to purchaser to be checked and initialed by him and forwarded to the administrative officer in charge, who will procure and approve signed vouchers and send the same to the chief disbursing clerk for payment.

6. For shipment instruments should be carefully packed in an outside box. If not so packed, express charges are greatly increased. No excelsior or other packing material which creates dust or dirt should be put in the instrument box.

RECORDS.

7. Each notebook and each single piece of map material for filing in the records should be plainly marked with all information necessary for filing it in its proper place.

8. Material for filing should be transmitted to the custodian. Under no circumstances is anything to be returned to the records without his knowledge.

9. If errors are discovered in the marking of any material drawn from the records, this fact should be brought to the attention of the custodian, in order that the card catalogue may be corrected.

9. Addresses of Employees.

1. The residence address of all employees while in the office, and the mail, telegraph, and express address of all officials of every class when absent from the office, whether on official business or for other reasons, must be reported to the chief clerk on the card provided for the purpose. This is necessary to insure safe and prompt transmittal of mail.

10. Supplies—Printed Forms and Notebooks, Stationery, and Instruments.

1. Requisitions for articles mentioned in the following lists should be made on Form 9–125 by the numbers and titles given below.

PRINTED FORMS, NOTEBOOKS, ETC.

Account book, 60-page 9–918
Account book, 140-page 9–919
Address, notification of, to chief clerk.
Admission to building 9–116
Agreement, care of public animals 9–057
Agreement, storage of public property 9–056
Astronomic reconnaissance 9–917
Auction sale advertisement 9–051
Auction sale, report of 9–040
Bill of lading, original 9–060
Bill of lading, duplicate 9–060a
Computation book, large 9–889
Computation book, small 9–904
Employment, field, application for 9–921
Foreign shipment in bond to Washington, label for 9–058
Freight, shipment through quartermaster 9–049
Freight or express shipment, label for 9–050
Geodetic coordinates, computation of 9–902
Geodetic distances, computation of 9–901
Geologic party, monthly report.
Geologists' time card.
"Instructions" of Geological Survey.
Instruments, transfer of, return 9–139
Instruments, field, receipt for 9–045
Land-survey field notebook 9–915
Leave of absence 9–151
Leave of absence for day or less 9–115
Level, bench-mark descriptions 9–916
Level notebook 9–903
Level party, weekly report 9–922
Mail, forwarding.
Mail, registered, label for.
Mail, second-class, label for 9–160
Meal card.
Mine notebook, large 9–927
Mine notebook, small 9–911
Pay roll. (See Voucher.)
Photographic exposure record book.
Pocket notebook, detachable leaves 9–896
Postal card, plain.
Proof-reading record.

STATIONERY.

Basket, desk, wire.
Basket, waste, wire.
Blotter, hand.
Bristol board.
Brush, camel's-hair, sizes 1 to 6.
Brush, varnish, 1 to 3 inch.
Cardboard.
Colors, pans, K. & E.
Copying book, Bushnell's No. 20.
Copying book, pen carbon.
Copying book, press.
Desk pad.
Eraser, ink.
Eraser, knife.
Eraser, pencil.
Eraser, typewriter.
Envelopes, blue, cloth-lined.
Envelopes, letter size.
Envelopes, letter size, return.
Envelopes, manila (specify size).
Envelopes, note size.
Envelopes, printed address.
Fasteners, paper, Eureka.
Fasteners, paper, Gem.
Fasteners, paper, McGill's, Nos. 1, 2, and 3.
Finger shield, rubber.
Ink, combined (copying and writing).
Ink, indelible drawing (specify color).
Ink, with filler for fountain pen.
Ink, with filler for fountain pen, wood case.
Ink, writing fluid, black.
Ink, writing fluid, red.
Inkstand.
Letter opener, steel.
Mucilage.
Mucilage cup.
Oil boards, for press copying book.
Pads, cloth, for press copying book.
Paper, blotting.
Paper, blue print.
Paper, cross-section.
Paper, foolscap.
Paper, note, headed.
Paper, orange.
Paper, pad, headed, field use.
Paper, pad, ruled, 8 by 10½ inches.
Paper, pad, scratch; letter, note, or small sizes.

Paper, semicarbon.
Paper, tissue.
Paper, tracing (roll of 24 sheets).
Paper, typewriter, headed, for Director's letters.
Paper, typewriter, headed, subject.
Paper, typewriter, headed, tnin, for carbon book.
Paper, typewriter, headed, Washington, D. C.
Paper, typewriter, plain, cap size.
Paper, typewriter, plain, letter size, tissue.
Paper, wrapping, manila.
Paper folder.
Paper weight.
Paste, in glass jar.
Paste, in tubes.
Penrack.
Pencil-point protectors, metal and rubber.
Pencil pointer (sandpaper block).
Pencils, Dixon's, Nos. 1 to 5.
Pencils, Faber's, Nos. 1 to 5.
Pencils, Kohinoor, Nos. B to 9-H.
Pencils, red, blue, green.
Penholder, drawing.
Penholder, writing.
Pens, crow-quill.
Pens, drawing.
Pens, mapping.
Pens, writing, various kinds.
Pins, pyramid.
Ribbon, typewriter, copying.
Ribbon, typewriter, noncopying.
(Mention kind of typewriter.)
Rubber bands, assorted sizes.
Ruler, boxwood, various sizes.
Saucer, paint.
Scissors, 6-inch.
Sealing wax.
Shears, 9-inch.
Shears, 10-inch.
Sponge.
Sponge cup.
Stenographer's notebook, pen.
Stenographer's notebook, pencil.
Tag, shipping, plain.
Tag, shipping, to the Director.
Tape, red, spool.
Thumb tacks.
Tracing cloth.
Tracing paper.
Twine, large or small sizes.

2. The articles mentioned in the following special list are designed especially for the use of the hydrographic branch:

HYDROGRAPHERS' SUPPLIES.

3. The articles mentioned in the following special list are furnished by the custodian of instruments, except stationery articles for the geologic branch, which are furnished by the supplies section. The letters preceding indicate the classes of work in which these articles are chiefly used, viz: G=geologic; H=hydrographic; L=leveling; To=topographic; Tr=triangulation.

SUPPLIES FOR FIELD PARTIES.

To. Alidades, sight (6-inch, 10-inch, 18-inch).
To. Alidades, sight (vertical angle).
To. Alidades, telescopic.
G. To. Aneroids (3,000 feet, 5,000 feet, 8,000 feet, 10,000 feet, 15,000 feet).
To. Bubbles, level.
H. Buzzers.
H. Cable, meter.
L. Tr. Cement.
To. Chains (33 feet, 66 feet, 100 feet).
G. To. Compasses, box.
G. Compasses, Brunton.
G. Compasses, clinometer.
G. To. Compasses, prismatic.
G. To. Copying books, letter (rolling).
L. To. Dies, bench-mark (figures, reference, and V. A. letters).
Glasses, field.
Tr. Gradienters.
Ink, fountain-pen filler.
G. To. Ink, indelible (black, orange, green, vermilion).
Instruments, drawing.
To. Levels, circular.
G. To. Levels, hand (Abney, Locke).
L. Levels, rod plumbing.
L. Levels, Y.
H. Mercury, bisulphate.
H. Meters.
To. Odometers.
L. Paint (in cans).
G. To. Paper, drawing and plane-table (double mounted).
Paper, drawing and plane-table (single mounted).
To. Paper, drawing and plane-table (traverse).
Paste.
Pencils, 7-H, 9-H.
L. Pins, turning-point.
To. Plane-table boards, 24 by 31 inches.
To. Plane-table boards, 18 by 24 inches.
To. Plane-table boards, 20 by 20 inches.

To. Plane-table boards, 15 by 15 inches (Johnson).
To. Plane-table boards, 15 by 15 inches (traverse).
To. Plane-table movements (Johnson).
Pointers, lead-pencil.
H. Poles, battery.
To. Recorders, hand.
L. Rods, leveling (New York, Philadelphia).
To. Scales, boxwood (45,000, 90,000, inch).
To. Scales, special.
To. Scribes, timber.
To. Tables (stadia, vertical angle).
L. Tablets, bench-mark.
Tr. Tablets, meridian.
Tablets, special.
Tr. Tablets, triangulation.
Tapes (metallic, steel).
Tr. Theodolites.
Tr. Transits.
To. Tripods, traverse.
G. To. Water colors (burnt sienna, prussian blue).

11. Vouchers.

1. Purchase vouchers (Forms 9–006 and 9–008) are to be used for direct payment by a disbursing officer to the person from whom a purchase is made and for assembling the subvouchers for miscellaneous expenses of an employee.

2. It is desirable that payment for purchases—other than board and lodging—involving large amounts should be made by the disbursing officer direct on purchase vouchers rather than through the chief of party by means of subvouchers. Accounts for amounts less than $10 should generally, however, be settled by a subvoucher.

3. When field material, such as tents, wagons, etc., is ordered through the administrative officer in charge, the consignee should check and approve the bill and forward the same to the administrative officer, so that the latter may prepare and approve purchase vouchers.

4. Vouchers for services must never include more than one calendar month. The service voucher (Form 9–010) is to be used for a single person, and the pay roll (Form 9–012) for two or more persons.

5. Write in the blank space at the head of the pay roll the locality where services are rendered. If this is not the post-office to which checks are to be sent, give the post-office address for each person, on line with the signature in the last column.

6. The body of the pay roll must state for each person the name, occupation, time of service, rate of pay, and total amount due, and be properly signed. Where the time is less than a full month, give first and last dates.

7. Pay for Sundays will not be allowed employees working by the day unless a statement is made that they rendered services on that day.

8. In computing rates of pay for fractions of a month the actual number of days in the month will be considered and amounts computed by aid of the tables appended hereto.

9. In order to secure prompt payment of salaries it is advisable to mail pay rolls for approval by the 20th of the month. If an employee leaves the service after a pay roll has been mailed, payment to him in cash must not be made, but immediate notice should be given the disbursing officer by telegraph in case a change is necessary.

10. Unless the disbursing officer is requested not to do so, he will mail checks for each party in a single envelope addressed to the chief of party, whose name and address should appear on the margin of the pay roll.

11. Subvouchers (Form 9–019) are to be used only in connection with main vouchers, never as main or independent vouchers.

12. *Under no circumstances must a subvoucher be signed before the amount in words is written in the receipt.* Each chief of party will be held strictly responsible for an enforcement of this rule.

13. Give year, month, and day of purchase in the body of the voucher. Give first and last meal or lodging in all board and lodging accounts, which must always be paid in cash; also name and title of employee for whom the same were furnished. Give first and last meal for forage accounts; and use terms "breakfast," "dinner," and "supper."

14. Subvouchers should be completely written up as soon as possible after they are signed and not left incomplete until the last of the month; and they should be forwarded for payment as soon as possible after the close of the month.

15. Duplicate subvouchers should not be separated into sets.

16. Complete copies of telegrams must accompany vouchers and subvouchers, and only Government rates will be allowed for telegraphic service. When messages go over the lines of two companies, state the fact on the voucher, giving charge for each.

17. All vouchers are to be prepared in duplicate, and must be sent to the administrative officer in charge for approval before they go to the disbursing officer for payment. The body of the subvouchers should be made out in full and properly signed before they are sent to the section chief for approval. The total amount *in words* must always be written in the receipt, except in a main voucher supported by subvouchers. In a main voucher never fill in the date, place of payment, or name of disbursing officer in the receipt. These are to be filled in by the disbursing officer to correspond with date, etc., on check.

18. When one voucher blank will not hold the account, use two or more, the last one only to be signed. Never paste the vouchers together lengthwise.

19. All main vouchers should be indorsed "Correct" in lower left-hand corner, with initials of the chief of party. The certificate is to be left blank for the signature of the administrative officer in charge.

20. Full descriptions—age, height, weight, color, sex, brands, etc.—must accompany vouchers for the purchase of animals.

21. Effort should be made to secure special rates for board and livery when the service is for a large number or an extended period.

22. Receipts must accompany vouchers for freight or expressage from incorporated companies. The vouchers must give date of shipment, shipping point, destination, names of consignee and consignor, amount charged, condition when received, and, when procurable, weight and rate; when these are not procurable a statement to that effect should be made.

23. For work under different appropriations or allotments separate vouchers for expenses, including salaries, must be presented. Thus, when a party or person leaves one cooperating State or general locality for field work elsewhere, expenses will be chargeable to the new work from the time of commencement of journey.

24. When amounts in vouchers are changed in any way by a disbursing officer, on account of mistakes or irregularities, notice of such changes should be promptly sent through the approving officer to the person in whose favor the account stands.

25. The fees for oaths in the States and Territories in verification of accounts are as follows:

Alabama:	
Notary	$0.50
Justice of the peace	.25
Arizona:	
Notary	.75
Justice of the peace	.50
Arkansas:	
Notary	.50
Justice of the peace	.50
California:	
Notary	.50
Justice of the peace	—
Colorado:	
Notary	.25
Justice of the peace	.25
Connecticut:	
Notary	.50
Justice of the peace	.10
Dakota:	
Notary	.25
Justice of the peace	.25
Delaware:	
Notary	.50
Justice of the peace	.25
District of Columbia:	
Notary	.50
Justice of the peace	—
Florida:	
Notary	.50
Justice of the peace	.16
Georgia:	
Notary	.50
Justice of the peace	.30
Idaho:	
Notary	.25
Justice of the peace	—
Illinois:	
Notary	.25
Justice of the peace	.35
Indiana:	
Notary	$0.50
Justice of the peace	.35
Iowa:	
Notary	.25
Justice of the peace	.25
Kansas:	
Notary	.25
Justice of the peace	.25
Kentucky:	
Notary	.50
Justice of the peace	.20
Louisiana:	
Notary	.75
Justice of the peace	.25
Maine:	
Notary	.20
Justice of the peace	.20
Maryland:	
Notary	.62½
Justice of the peace	.30
Massachusetts:	
Notary	.25
Justice of the peace	.25
Minnesota:	
Notary	.25
Justice of the peace	.15
Michigan:	
Notary	.25
Justice of the peace	.25
Mississippi:	
Notary	.50
Justice of the peace	.25
Missouri:	
Notary	.50
Justice of the peace	.20
Montana:	
Notary	.50
Justice of the peace	.50

Nebraska:	
Notary	$0.25
Justice of the peace	.25
Nevada:	
Notary	.55
Justice of the peace	.30
New Hampshire:	
Notary	.25
Justice of the peace	.25
New Jersey:	
Notary	.32
Justice of the peace	.32
New Mexico:	
Notary	.50
Justice of the peace	—
New York:	
Notary	.25
Justice of the peace	.25
North Carolina:	
Notary	.50
Justice of the peace	.10
North Dakota:	
Notary	.25
Justice of the peace	.25
Ohio:	
Notary	.40
Justice of the peace	.40
Oklahoma:	
Notary	.25
Justice of the peace	.10
Oregon:	
Notary	1.00
Justice of the peace	.25
Pennsylvania:	
Notary (Except Allegheny County, $1; city of Philadelphia, $0.37½; counties of Blair, Center, Lycoming, Montour, Snyder, Westmoreland, and Wyoming, $0.37½; York County, $0.31¼.)	.25
Justice of the peace	$0.25
Rhode Island:	
Notary	.50
Justice of the peace	.50
South Carolina:	
Notary	.50
Justice of the peace	.30
South Dakota:	
Notary	—
Justice of the peace	—
Tennessee:	
Notary	.50
Justice of the peace	.20
Texas:	
Notary	.25
Justice of the peace	.25
Utah:	
Notary	.50
Justice of the peace	.25
Vermont:	
Notary	.25
Justice of the peace	—
Virginia:	
Notary	.25
Justice of the peace	.25
Washington:	
Notary	.50
Justice of the peace	—
West Virginia:	
Notary	.25
Justice of the peace	.30
Wisconsin:	
Notary	.25
Justice of the peace	.12
Wyoming:	
Notary	.50
Justice of the peace	.25

12. Express and freight.

1. Articles intended for shipment from the office must be plainly marked and be accompanied by a shipping card signed by the administrative officer in charge, or his representative. Form 9–122, a double postal card, notice of shipment from office, will be sent to consignee, who is expected to promptly sign and return the receipt half.

2. A copy of Form 9–050 should be pasted securely on every box or case intended for shipment to the Washington office. When necessary the special tag provided for such purpose may be used. Form 9–052, a double postal card, notice of shipment to office, should in all cases be used, and upon receipt of the shipment at the office the return half will be signed and sent to the consignor.

3. So far as practicable, shipments should be consolidated—that is, articles forwarded from the same locality at about the same time should be covered by a single transaction; when made by express the receipt with notice of shipment should be sent to the Washington office.

4. All packages consigned to the office should be addressed to the Director of the United States Geological Survey; otherwise they will be treated as private property.

5. Property forwarded by express should not be valued on the receipt at more than $50.

6. In shipping freight all railroads except the Southern Pacific accept through bills of lading. The Southern Pacific requires a separate and distinct bill of lading to cover transportation from point to point over that road. When a shipment is made over connecting lines an additional bill of lading must be issued covering transportation from the connecting point on the Southern Pacific to the point of destination. These bills of lading should be handed to the agent of the forwarding road, who will transmit the originals to the connecting lines.

In all cases where more than one bill of lading is issued the following must be marked upon the face of all originals and duplicates: "Settlement to be made on basis of division rate between ultimate points."

All railroads except the Wabash have agreed to accept the rate of land-grant routes; therefore no shipments on account of the Government can be made over the Wabash.

7. So far as practicable, registered mail should be used in preference to express. The limit of 4 pounds for packages by mail applies only to articles classed as merchandise; written and printed matter is not limited in weight when forwarded from an executive department at Washington.

8. See the manual of "Regulations" (page 51, sec. 68) for further instructions.

13. Telegrams.

1. Messages to Washington should be sent "collect," and those from Washington "charge Geological Survey," Form 9–132 being used for the latter.

2. A book of forms for field use has been provided, by which messages may be sent from any point without cash payment and be charged to the Geological Survey.

3. The rates established for United States Government messages in 1903 will be found in the following tables. As there indicated these rates are for messages of 20 words or less, address and signature counted.

4. If at any time during the year the commercial rate shall be less than that in the tables referred to, then the commercial rate is to be applied to Government messages.

5. All messages designed for transmission at Government rates should be indorsed "official business," to which should be added the official title of the sender.

Table of rates for United States Government messages of 20 words or less, counting address, body words, and signature.

[For additional-word rates and night-message rates, see page 38.]

State.	Alabama.	Arizona.	Arkansas.	California.	Colorado.	Connecticut.	Delaware.	Dist. Columbia.	Florida.	Georgia.	Idaho.	Illinois.	Indiana.	Indian Ter.	Iowa.	Kansas.	Kentucky.	Louisiana.	Maine.	Maryland.	Massachusetts.	Michigan.	Minnesota.	Mississippi.	Missouri.
Alabama	20	30	20	40	25	25	20	20	20	20	35	20	20	20	20	20	20	20	25	20	25	20	25	20	20
Arizona	30	20	25	20	25	40	40	35	30	30	30	30	30	25	30	25	30	30	40	40	40	35	30	25	30
Arkansas	20	25	20	35	20	25	25	25	20	20	30	20	20	20	20	20	20	20	30	25	25	20	20	20	20
California	40	20	35	20	25	40	40	40	40	40	25	35	35	35	30	30	40	35	40	40	40	35	35	35	35
Colorado	25	25	20	25	20	30	30	30	30	30	20	25	20	20	25	20	20	25	25	35	30	35	25	20	25
Connecticut	25	40	25	40	30	20	20	20	25	20	40	25	20	30	25	25	20	30	20	20	20	20	25	25	25
Delaware	20	40	25	40	30	20	20	20	25	20	40	20	20	25	25	25	20	25	20	20	20	20	25	25	25
Dist. of Columbia	20	35	25	40	30	20	20	20	20	20	40	20	20	25	25	25	20	25	20	20	20	20	25	25	25
Florida	20	30	20	40	30	25	25	20	20	20	40	20	20	20	25	25	20	25	20	25	25	25	25	20	20
Georgia	20	30	20	40	30	20	20	20	20	20	35	20	20	20	20	20	20	20	25	20	25	20	25	20	20
Idaho	35	30	30	25	20	40	40	40	40	35	20	30	30	30	25	25	35	35	40	40	40	35	30	35	30
Illinois	20	30	20	35	20	25	20	20	20	20	30	20	20	20	20	20	20	20	25	20	25	20	20	20	20
Indiana	20	30	20	35	25	20	20	20	20	20	30	20	20	20	20	20	20	20	25	20	20	20	20	20	20
Indian Territory	20	25	20	35	20	30	25	25	20	20	30	20	20	20	20	20	20	20	30	25	30	20	20	20	20
Iowa	20	30	20	30	20	25	25	25	25	20	25	20	20	20	20	20	20	20	25	30	25	25	20	20	20
Kansas	20	25	20	30	20	25	25	25	25	20	25	20	20	20	20	20	20	20	30	25	30	20	20	20	20
Kentucky	20	30	20	40	25	20	20	20	20	20	35	20	20	20	20	20	20	20	25	20	25	20	20	20	20
Louisiana	20	30	20	35	25	30	25	25	20	20	35	20	20	20	25	20	20	20	30	25	30	25	25	20	20
Maine	25	40	30	40	35	20	20	20	25	25	40	25	25	30	30	30	25	30	20	20	20	20	25	30	25
Maryland	20	40	25	40	30	20	20	20	20	20	40	20	20	25	25	25	20	25	20	20	20	20	25	25	25
Massachusetts	25	40	25	40	35	20	20	20	25	25	40	25	20	30	25	30	25	30	20	20	20	20	25	25	25
Michigan	20	35	20	35	25	20	20	20	25	20	35	20	20	20	20	20	20	20	25	20	20	20	20	20	20
Minnesota	25	30	20	35	20	25	25	25	25	25	30	20	20	20	20	20	20	25	25	25	25	20	20	25	20
Mississippi	20	25	20	35	25	25	25	25	20	20	35	20	20	20	20	20	20	20	30	25	25	20	25	20	20
Missouri	20	30	20	35	20	25	25	25	20	20	30	20	20	20	20	20	20	20	25	25	25	20	20	20	20
Montana	35	35	30	25	25	35	35	35	40	35	20	30	30	30	25	25	30	35	35	35	35	30	25	35	30
Nebraska	20	30	20	30	20	25	25	25	25	25	20	20	20	20	20	20	20	25	30	25	30	20	20	20	20
Nevada	40	25	35	20	25	40	40	40	40	40	25	35	35	30	30	30	35	35	40	40	40	35	35	35	30
New Hampshire	25	40	25	40	35	20	20	20	25	25	40	25	20	30	25	30	25	30	20	20	20	20	25	30	25
New Jersey	20	40	25	40	30	20	20	20	25	20	40	20	20	25	25	25	20	25	20	20	20	20	25	25	25
New Mexico	25	20	25	25	20	35	35	35	30	30	25	25	25	20	25	20	25	25	35	35	35	30	25	25	25
New York	25	40	25	40	30	20	20	20	25	25	40	20	20	25	25	25	20	30	20	20	20	20	25	25	25
North Carolina	20	35	20	40	30	20	20	20	20	20	40	20	20	25	25	25	20	25	20	20	20	20	25	20	25
North Dakota	30	35	25	30	25	30	30	30	30	30	25	20	25	25	20	20	25	30	30	30	30	25	20	25	20
Ohio	20	35	20	40	25	20	20	20	20	20	35	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Oklahoma	20	25	20	30	20	30	30	25	25	20	30	20	20	20	20	20	20	20	30	30	30	25	20	20	20
Oregon	40	30	35	20	25	40	40	40	40	40	20	35	35	35	35	30	40	40	40	40	40	40	30	40	35
Pennsylvania	20	40	25	40	30	20	20	20	20	20	40	20	20	20	25	25	20	25	20	20	20	20	25	25	20
Rhode Island	25	40	25	40	35	20	20	20	25	25	40	25	20	30	25	30	25	30	20	20	20	20	25	25	20
South Carolina	20	35	20	40	30	20	20	20	20	20	40	20	20	25	25	25	20	25	20	20	20	20	25	20	20
South Dakota	25	35	25	35	20	30	30	30	30	25	30	20	20	20	20	20	25	25	30	30	30	25	20	25	20
Tennessee	20	30	20	40	25	25	20	20	20	20	35	20	20	20	20	20	20	20	25	20	25	20	20	20	20
Texas	20	25	20	30	20	30	30	30	20	20	30	20	25	20	20	20	25	20	35	30	30	25	25	20	20
Utah	30	30	25	20	20	35	35	35	35	20	25	30	25	25	25	30	30	40	35	40	30	25	30	25	30
Vermont	25	40	25	40	35	20	20	20	25	25	40	25	20	30	25	30	25	30	20	20	20	20	25	30	25
Virginia	20	35	25	40	30	20	20	20	20	20	40	20	20	25	25	25	20	25	20	20	20	20	25	20	25
Washington	40	30	40	20	30	40	40	40	40	40	20	35	40	35	35	35	40	40	40	40	40	40	30	40	35
West Virginia	20	35	20	40	25	20	20	20	20	20	30	20	20	20	20	20	20	25	25	20	20	20	20	20	20
Wisconsin	20	30	20	35	25	25	20	20	25	20	30	20	20	20	20	20	20	25	25	20	25	20	20	20	20
Wyoming	30	25	25	25	20	30	30	30	30	30	20	20	25	20	20	25	25	35	30	35	25	20	25	20	20

Table of rates for United States Government messages, etc.—Cont'd.

[For additional-word rates and night-message rates, see page 38.]

State.	Montana.	Nebraska.	Nevada.	New Hampshire.	New Jersey.	New Mexico.	New York.	North Carolina.	North Dakota.	Ohio.	Oklahoma.	Oregon.	Pennsylvania.	Rhode Island.	South Carolina.	South Dakota.	Tennessee.	Texas.	Utah.	Vermont.	Virginia.	Washington.	West Virginia.	Wisconsin.	Wyoming.
Alabama	35	20	40	25	20	25	25	20	30	20	20	40	20	25	20	25	20	20	30	25	20	40	20	20	30
Arizona	35	30	25	40	40	20	40	35	35	35	25	30	40	40	35	35	30	25	30	40	35	30	35	30	25
Arkansas	30	20	35	25	25	25	20	25	20	25	20	20	35	25	25	20	25	20	20	25	25	40	20	20	25
California	25	30	20	40	40	25	40	40	30	40	30	20	40	40	40	35	40	30	20	40	40	20	40	35	25
Colorado	25	20	25	35	30	20	30	30	25	25	20	25	30	35	30	20	25	20	20	35	30	30	25	25	20
Connecticut	35	25	40	20	20	35	20	20	30	20	30	40	20	20	20	30	25	30	35	20	20	40	20	25	30
Delaware	35	25	40	20	20	35	20	20	30	20	30	40	20	20	20	30	20	30	35	20	20	40	20	20	30
Dist. of Columbia	35	25	40	20	20	35	20	20	30	20	25	40	20	20	20	30	20	30	35	20	20	40	20	20	30
Florida	40	25	40	25	25	30	25	20	30	20	25	40	20	25	20	30	20	20	35	25	20	40	20	25	30
Georgia	35	25	40	25	20	30	25	20	30	20	20	40	20	25	20	25	20	20	35	25	20	40	20	20	30
Idaho	20	25	25	40	40	25	40	40	25	35	30	20	40	40	40	30	35	30	20	40	40	20	35	30	20
Illinois	30	20	35	25	20	25	20	20	20	20	20	35	20	25	20	20	20	20	25	25	20	35	20	20	20
Indiana	30	20	35	20	20	25	20	20	25	20	20	35	20	20	20	20	20	25	30	20	20	40	20	20	25
Indian Territory	30	20	30	30	25	20	25	25	25	20	20	35	25	30	25	20	20	20	25	30	25	35	20	20	20
Iowa	25	20	30	25	25	25	25	20	20	20	20	35	25	25	25	20	20	20	25	25	25	35	20	20	20
Kansas	25	20	30	30	25	20	25	25	20	20	20	30	25	30	25	20	20	20	25	30	25	35	20	20	20
Kentucky	30	20	35	25	20	25	20	20	25	20	20	40	20	25	20	25	20	25	30	25	20	40	20	20	25
Louisiana	35	25	35	30	25	25	30	25	30	20	20	40	25	30	20	25	20	20	30	30	25	40	25	20	25
Maine	35	30	40	20	20	35	20	20	30	20	30	40	20	20	25	30	25	35	40	20	20	40	25	25	35
Maryland	35	25	40	20	20	35	20	20	30	20	30	40	20	20	20	30	20	30	35	20	20	40	20	20	30
Massachusetts	35	30	40	20	20	35	20	20	30	20	30	40	20	20	20	30	25	30	40	20	20	40	20	25	35
Michigan	30	20	35	20	20	30	20	20	25	20	25	40	20	20	20	25	20	25	30	20	20	40	20	20	25
Minnesota	25	20	35	25	25	25	25	25	20	20	20	30	25	25	25	20	20	25	25	25	25	30	20	20	20
Mississippi	35	20	35	30	25	25	25	20	25	20	20	40	25	25	20	25	20	20	30	30	20	40	20	20	25
Missouri	30	20	30	25	25	25	25	25	20	20	20	35	20	25	20	20	20	20	25	25	25	35	20	20	20
Montana	20	25	25	35	25	35	25	35	25	30	30	20	35	40	35	25	30	30	20	35	35	20	30	25	20
Nebraska	25	20	30	30	25	20	25	25	20	20	20	30	25	30	25	20	20	20	25	30	25	30	20	20	20
Nevada	25	30	20	40	40	30	40	40	30	35	30	20	40	40	40	35	35	35	20	40	40	20	40	35	25
New Hampshire	35	30	40	20	20	35	20	20	30	20	30	40	20	20	20	30	25	30	40	20	20	40	20	25	35
New Jersey	35	25	40	20	20	35	20	20	30	20	30	40	20	20	20	30	20	30	35	20	20	40	20	20	30
New Mexico	25	20	30	35	30	20	35	35	30	20	30	30	30	35	30	25	25	25	20	35	35	30	30	25	20
New York	35	25	40	20	20	35	20	20	30	20	30	40	20	20	20	30	20	25	30	35	20	20	40	20	30
North Carolina	35	25	40	20	20	35	20	20	30	20	25	40	20	20	20	30	20	25	35	20	20	40	20	25	30
North Dakota	20	20	30	30	30	30	30	30	20	25	25	25	30	30	30	20	25	25	25	30	30	25	25	20	25
Ohio	30	20	35	20	20	30	20	20	25	20	20	40	20	20	20	25	20	25	30	20	20	40	20	20	25
Oklahoma	30	20	30	30	30	20	30	25	25	20	20	35	25	30	25	20	20	20	25	30	25	35	25	20	20
Oregon	20	30	20	40	40	30	40	40	25	40	35	20	40	40	40	30	40	35	20	40	40	20	40	35	25
Pennsylvania	35	25	40	20	20	30	20	20	30	20	25	40	20	20	20	25	20	30	35	20	20	40	20	20	30
Rhode Island	40	30	40	20	20	35	20	20	30	20	30	40	20	20	20	30	25	30	40	20	20	40	20	25	35
South Carolina	35	25	40	20	20	30	20	20	30	20	25	40	20	20	20	30	20	25	35	25	20	40	20	20	30
South Dakota	25	20	35	30	30	25	30	30	20	25	20	30	25	30	30	20	25	25	25	30	30	30	25	20	20
Tennessee	30	20	35	25	20	25	25	20	25	20	20	40	20	25	20	25	20	20	30	25	20	40	20	20	25
Texas	30	20	35	30	30	25	30	25	25	25	20	35	30	30	25	25	20	20	25	30	30	35	25	25	25
Utah	20	25	20	40	35	20	35	35	25	30	25	20	35	40	35	25	30	25	20	40	35	25	30	30	20
Vermont	35	30	40	20	20	35	20	20	30	20	30	40	20	20	25	30	25	30	40	20	20	40	20	25	35
Virginia	35	25	40	20	20	35	20	20	30	20	25	40	20	20	20	30	20	30	35	20	20	40	20	20	30
Washington	20	30	20	40	40	30	40	40	25	40	35	20	40	40	40	30	40	35	25	40	40	20	40	35	25
West Virginia	30	20	40	20	20	30	20	20	25	20	25	40	20	20	20	25	20	25	30	20	20	40	20	20	25
Wisconsin	25	20	35	25	20	25	20	25	20	20	20	35	20	25	20	20	20	25	30	25	20	35	20	20	20
Wyoming	20	20	25	35	30	20	30	30	25	25	20	25	30	35	30	20	25	25	20	35	30	25	25	20	20

Table of rates for United States Government messages, etc.—Cont'd.

Number of words.	Tolls for 20 words and multiples of 20, together with tolls for additional words.						
	Day messages.					Night messages.	
	When rate is 20 cents.	When rate is 25 cents.	When rate is 30 cents.	When rate is 35 cents.	When rate is 40 cents.	When day rate is 20, 25 or 30 cents, night rate is—	When day rate is 35 or 40 cents, night rate is—
20	$0.20	$0.25	$0.30	$0.35	$0.40	$0.15	$0.25
40	.40	.50	.60	.70	.80	.35	.45
60	.60	.75	.90	1.05	1.20	.55	.65
80	.80	1.00	1.20	1.40	1.60	.75	.85
100	1.00	1.25	1.50	1.75	2.00	.95	1.05
200	2.00	2.50	3.00	3.50	4.00	1.95	2.05
300	3.00	3.75	4.50	5.25	6.00	2.95	3.05
400	4.00	5.00	6.00	7.00	8.00	3.95	4.05
500	5.00	6.25	7.50	8.75	10.00	4.95	5.05
Additional words.							
1	.01	.01	.02	.02	.02	.01	.01
2	.02	.03	.03	.04	.04	.02	.02
3	.03	.04	.05	.05	.06	.03	.03
4	.04	.05	.06	.07	.08	.04	.04
5	.05	.06	.08	.09	.10	.05	.05
6	.06	.08	.09	.11	.12	.06	.06
7	.07	.09	.11	.12	.14	.07	.07
8	.08	.10	.12	.14	.16	.08	.08
9	.09	.11	.14	.16	.18	.09	.09
10	.10	.13	.15	.18	.20	.10	.10
11	.11	.14	.17	.19	.22	.11	.11
12	.12	.15	.18	.21	.24	.12	.12
13	.13	.16	.20	.23	.26	.13	.13
14	.14	.18	.21	.25	.28	.14	.14
15	.15	.19	.23	.26	.30	.15	.15
16	.16	.20	.24	.28	.32	.16	.16
17	.17	.21	.26	.30	.34	.17	.17
18	.18	.23	.27	.32	.36	.18	.18
19	.19	.24	.29	.33	.38	.19	.19

14. Auction Sales.

1. General authority is granted each year by the Director for the disposal of worn-out or useless property at auction, sales to be made at times and places designated by administrative officers in charge.

2. Duplicate inspection reports (Form 9–047) must be prepared,

giving a complete inventory of all property to be sold, with a statement as to its condition and the reasons why it should be sold.

3. The property must be advertised by posters, for which blanks are provided. The posters should be put up in conspicuous places at least forty-eight hours before the sale. There being no contingent fund from which to pay the fee of an auctioneer, it will be necessary for some member of the Survey to act in that capacity. All sales must be for cash, and a record must be made of each article sold, including name of purchaser and amount received. Articles of little value may be sold in lots, in which case each item in the lot, as well as the price for which the lot is sold, is to be reported. Inspection and sale reports must agree as to the items mentioned. Accounts of auction sales must be in duplicate, on Form 9–040, and as soon as practicable after the sale these forms must be properly filled out and transmitted, with the inspection reports, to the Director, through the division or section chief, together with the amount received from the sale.

15. Relations to the Public.

1. Courtesy to the public is enjoined on every employee of the Geological Survey while engaged in official duties. When persons make serious inquiry concerning the work the Survey is doing, time should be taken to give them the information. Discourtesy to the people of the country will not be tolerated, and chiefs of parties will be expected to discipline or discharge employees for flagrant neglect to conduct themselves with politeness and propriety. Where cooperation between the Federal and State governments is in force, employees will be expected to make known to citizens the relations of the State to the work.

2. It sometimes happens that objection is made to entry upon private property by employees engaged in official work, but it is believed that generally this objection may be overcome by an explanation of the public character of the work. The governors of the different States and Territories have recently recommended to their respective legislatures the enactment of laws granting this authority to officials of the United States Geological Survey, as has already been done in some States for the benefit of the United States Geological Survey and in many for the Coast and Geodetic Survey.

16. Entertaining Persons in Camp.

1. Heads of parties and all other employees of the Survey are cautioned, when on field duty, against entertaining in camp any persons, whether acquaintances, friends, or relatives, in a manner to interfere with public business. Instruments, outfit, and supplies are provided at Survey expense for official purposes only, and should be employed solely to advance official work. Members of the Survey are required to give their time and labor strictly to official business.

2. Division, section, and party chiefs are expected to bring this order to the attention of all concerned and to enforce it strictly, reporting to the Director any violation thereof.

17. Care and Storage of Public Property and Pasturage of Public Animals.

1. In arranging for the storage of camp property and the pasturage of public animals at the close of field work effort should be made to locate the same as near as possible to a main line of railway.

2. The camp material should be placed in boxes, the boxes numbered, and lists made of the articles stored in each box. The boxes should be stored in a camp wagon under shelter, in a storeroom, or in some other dry and safe place, and should be securely packed and nailed, so that if necessary they may be in condition to be shipped by rail.

3. Signed agreements should be entered into with the person taking charge of the property or pasturing the animals. Forms 9–056 and 9–057 are provided for this purpose.

4. The following precautions should be taken in storing property, and employees will be held personally responsible for neglect of the same:

(*a*) All cooking untensils, etc., must be thoroughly cleaned and dried before packing, and no provisions should be stored.

(*b*) All tents, harness, blankets, ropes, etc., must be thoroughly dried in the sun before packing.

(*c*) All harness must be oiled with harness oil.

(*d*) All axles of vehicles must be cleaned with coal oil and well covered with axle grease.

(*e*) Detailed inventory of all property stored must be taken on Form 9–054, with statement of condition.

5. Every article of property which appears on a voucher as having been purchased, and which is not expendable, must be accounted for on the returns of a custodian. Those in whose direct charge property is should exercise great care in its preservation and be prepared at all times to make a statement to the custodian as to its condition and the amount on hand.

GEOLOGIC BRANCH.

18. Organization.

1. The geologic branch is organized under the following divisions: (1) Geology and paleontology, (2) mining and mineral resources, (3) physics and chemistry.

2. For purposes of scientific supervision, as distinct from administrative control, the following sections are established in the division of geology and paleontology: (1) areal geology, (2) Pleistocene geology, (3) pre-Cambrian and metamorphic geology, (4) petrology, (5) economic geology of metalliferous ores, (6) economic geology of nonmetalliferous minerals, (7) paleontology.

3. In regard to the special subjects assigned to him, the authority of a geologist in charge of a section shall be coextensive, geographically and otherwise, with the operations of the Survey. Each section chief shall confer with his fellow-chiefs with a view: (*a*) To adjusting proposed plans; (*b*) to calling attention to opportunities or questions coming to his notice, but not within his sphere; (*c*) to promoting cooperation, which is a fundamental principle of the organization. Where geologic investigation of any field involves questions which come within the spheres of two or more section chiefs, their cooperation is imperative. In such cases, therefore, they shall by mutual agreement determine upon either (*a*) a plan of joint action, by which each will supervise those matters falling within his sphere, or (*b*) a plan of supervision by one, in case the interest of that one greatly preponderates, the other chief or chiefs acting in an advisory capacity.

4. Each chief shall seek to effect such exchange of information and views with any geologist carrying on work under his scientific direction as will give the results their highest practicable scientific

value and justify his approval on the basis of definite knowledge of field and office work.

5. The position of section chief confers no prerogative of authorship in relation to the work of any other geologist or paleontologist. It confers the right and duty to consider for recommendation all manuscripts which relate to subjects coming within the scope of one's authority as chief, and the disposition of a manuscript shall be determined by the nature of such recommendation, subject to the approval of the geologist in charge of geology, provided that any author may appeal to the Director from the decision of the section chief or of the geologist in charge.

6. For the larger part, the planning and execution of the geologic work is intrusted directly to chiefs of parties. Any section chief, geologist, or assistant geologist may be assigned to duty as chief of party, and in this relation he may have assistants who report to him. The chief of party shall prepare plans and estimates for the work committed to him, and, after securing advice and suggestion from the section chiefs concerned, shall submit these, over his own signature, to the geologist in charge of geology. The approval of the geologist in charge only may confer authority to execute plans. Allotments are made to the chief of party directly, and he is responsible to the geologist in charge for disbursements and for execution of plans.

7. In preparing material for study or publication the chief of party shall continue conferences with the section chiefs concerned. Completed manuscript shall be sent by assistants to the chief of party concerned, and he shall transmit such manuscript, as well as his own, to the Director. It will then be sent to the geologist in charge of geology, who will refer it to one or more section chiefs, each of whom shall make such recommendations as the treatment of his subject may require. When approved for publication, each manuscript shall be sent to the Director, accompanied by a formal letter of transmittal, indorsed by the section chiefs who shall have passed upon it.

19. Monthly Reports.

1. A report in card form must be made out and transmitted promptly at the end of each month by each geologist, paleontologist, and assistant, who holds an appointment from the Secretary

of the Interior and has been engaged any part of the month on Survey work; also by each geologist, paleontologist, and assistant who has an allotment from Survey funds, whether employed during the month or not. No voucher for services or expenses will be paid to any person who is a month or more in arrears with his monthly reports.

2. The work of field assistants should be included in the report of the chief of party. Assistant geologists working under the immediate supervision of a chief of party should make duplicate reports, one to the geologist from whom instructions are received and the other to the geologist in charge of geology.

3. The report in card form is intended to replace the ordinary written report. It should be a concise account of the manner in which the person making the report was occupied, and will constitute his personal record. The face of the card should show, by inclusive dates and numbers, the kind of occupation for each day in the month.

4. When areal work is done on or adjacent to mapped quadrangles, a convenient portion of the ruled face of the card should be included within neat lines and given the quadrangle names. The portion of the area covered by work of each class should be indicated by shading, and the class of work by the appropriate number, placed either on the quadrangle area or on a block of the same shading outside.

5. When work on areal geology for folio publication is confined to Pleistocene deposits, that fact should be indicated.

6. When work is done which falls under the head of "General reconnaissance," the routes followed and areas covered should be indicated by a sketch on the face of the card, indicating latitude and longitude when possible.

7. When several classes of work are done on the same days, an estimate of the time devoted to each should be made and expressed in percentages of the whole time covered by the inclusive dates.

8. The face of the card will ordinarily be sufficient for areal diagram and the abstract of occupation, but if not the latter may be continued on the back.

9. Any exceptional conditions which influence the character or amount of work accomplished should be briefly noted on the back of the card.

10. In case it appears desirable for any reason to make a more ample report than the card form permits, a supplementary report may be made by letter, but the fact that such a report is made should be stated on the card, together with a brief abstract of its contents. This provides for the preliminary statement of economic and scientific results, which is frequently desirable.

20. Geologic Notes.

1. In taking geologic notes it is important that facts be recorded with the utmost fullness, and be separated carefully from inferences and theories. It is desirable that theories and hypotheses should also be written down, but an effort should be made to separate them from the phenomena actually observed. So far as practicable, notes should be written while the objects described are being examined. In this way description is made more accurate and observation more thorough.

2. Geologic notebooks are the property of the Government. They should be carefully and systematically numbered and indexed, and all notes should be taken in such a manner as to be readily understood by any person having occasion to use them.

21. Information.

1. Members of the geologic branch are instructed to exercise great caution in making public any information which they may obtain in the course of their work. In general, all matter for the daily press should pass through the hands of the committee on publicity and be issued in the regular press bulletins. Only in exceptional cases should interviews be given to reporters.

2. Geologists are expressly forbidden to give out to individuals or corporations, in advance of actual publication, the results arrived at in the course of their geologic examination of a district or area. They are at liberty, however, to communicate orally to the owner or manager of a mineral property during the progress of its investigation such information with regard to the geology of that property as may be of value to him in its development; but written statements must be avoided, lest they be used for promoting or unduly enhancing values. This regulation, it will be under-

stood, is designed to assure a fair and equal participation, by all who are interested, in the advantages that may result from the work of the Survey, and to avoid any appearance or suspicion of favoritism.

3. As stated in "Regulations," information of a confidential character, such as mine maps, drill records, statistics of production, etc., supplied by private parties or corporations, must be carefully guarded and be used in the preparation of reports for publication strictly in accordance with the conditions stipulated by the persons furnishing it.

22. Geologic Nomenclature.

1. Among the "Rules of nomenclature and classification for the Geologic Atlas of the United States" are the following:

> For purposes of general correlation, formations shall be referred to the standard systems of common usage. Beginning with the latest the systems recognized are as follows: Quaternary, Tertiary, Cretaceous, Jurassic, Triassic, Carboniferous, Devonian, Silurian, Ordovician, Cambrian, Algonkian, and Archean. . . . Within the systems smaller aggregates of formations may be recognized which shall be called *series*, and these may be divided into subordinate *groups* of formations. Groups may also be constituted without the recognition of series. . . . The following series are now recognized as applicable to North America: In the Quaternary, Recent and Pleistocene; in the Tertiary, Pliocene, Miocene, Oligocene, and Eocene; in the Carboniferous, Permian, Pennsylvanian, and Mississippian; in the Cambrian, Saratogan, Acadian, and Georgian. In the other systems subdivisions of the rank of series may be temporarily distinguished as Upper and Lower, or Upper, Middle, and Lower, as each case may require; or, when different provinces show a distinct development, provincial names may be used for series and groups.

It is desirable that authors of papers published by the Survey should adhere to these rules.

2. In regard to definition and application of geologic formation names, certain rules have been adopted by the Survey, which are based upon principles of priority and established usage. A committee on geologic names has been appointed to interpret these rules in particular cases, and geologists and paleontologists are directed to transmit, considerably in advance of the presentation of manuscript, a list of the names they intend to use for newly established stratigraphic divisions.

3. The use of names currently employed to designate formations or other stratigraphic divisions is permissible without reference to

the committee on geologic names, when field work of a precise stratigraphic nature has not been carried out and no new contribution to the definition of a formation or other stratigraphic division is made.

23. Collections.

1. *Importance of collections.*—The law creating the Survey provides that all collections of the Survey, "when no longer needed for investigations in progress, shall be deposited in the National Museum." This provision was plainly intended to avoid the building up of a great permanent collection, which would duplicate in large degree the geologic collections of the Museum, and also to secure the preservation of collections illustrating the formations and resources of areas studied by the Survey, as described in official reports. It further serves to secure to the Museum all duplicate material for its special needs. Geologists should recognize the importance of improving their opportunities for making valuable collections of rocks, minerals, ores, and fossils, not only for their immediate use in the preparation of reports, but for the building up of collections in the National Museum, which are available to all for comparative or special studies.

2. *Private collections not allowed.*—The provision of law that all collections of the Survey belong ultimately to the National Museum naturally prohibits members of the Survey from making collections for themselves, for other persons, or for institutions. The "Regulations" of the Survey provide (p. 18) for one exception to this prohibition, permitting geologists to "retain working specimens for themselves, provided such collections are made during the progress of their work and in such manner as not to affect the value of the Government collections." It is a recognized function of the National Museum to distribute specimens from its stores of exchange or duplicate material to institutions or individual specialists upon request; hence the geologist, by collecting abundant duplicate specimens of specially interesting objects, can supply, through the Museum, the wants of either individuals or institutions.

3. *Labeling of specimens.*—(*a*) In collecting, great care should be taken to make an accurate record of the locality at which each specimen is found, in order that the exact place may be easily

identified at any subsequent time by the collector himself or by any other person. This may be done in either of the two following ways: First, write upon the field label, at the time of collecting the specimen, a precise designation of its locality, together with the name of the collector and the date. Place it with the specimen and wrap them together in paper. The label should usually be folded before wrapping, so as to avoid wear in transportation. Or, second, number the specimens in the order of collection; mark the specimen number with indelible ink on a map of the district, indicating the exact locality by means of a small cross; write on the field label the date, the name of the collector, and a number, together with the number and page of a notebook in which a corresponding entry is made; in the notebook refer to the specimen by number, and describe its locality and relations. One series of numbers may be used for fossils and another series for rocks, minerals, and ores. A series of numbers may be limited to an excursion, a general locality, a quadrangle, or a region.

(*b*) In some classes of work the first method will be more convenient; in other classes, the second. One of them should be selected and adhered to throughout the season, and no method should be employed which will leave any possibility of confusion or ambiguity as to exact locations. It is recommended that a small paster bearing the number (in pencil or ink) be placed on each specimen in the field, thus diminishing liability of confusion through accident. It is further suggested that the number be written with soft blue pencil on the wrapped specimen. This is a great convenience at the time of unpacking.

4. *Collection of rocks.*—(*a*) Rock specimens which are to be retained in permanent collections (referred to on page 54) should be reasonably uniform in size and shape. They should approximate 3 by 4 inches in larger dimensions and be, if possible, less than 1 inch thick. In order that material for extra thin sections or for chemical work may be available for future needs, specimens should not be trimmed too closely. Size and shape are both subordinate to the satisfactory representation of rock characters. The skill necessary to procure well-shaped specimens of massive rock may be acquired in a short time and should be possessed by

every geologist. Collections composed of too large or too small, unsightly and inconveniently shaped specimens are justified only by unusual field conditions.

(*b*) Where there are numerous occurrences of a given rock type the geologist may often wish to collect working specimens to check his field determinations, and these may be of less than the regulation size, but care should be taken that all important rocks are represented by full-sized specimens.

(*c*) It is often desirable to collect specimens for exhibition in the National Museum, and in such cases the specimens should, so far as practicable, have the size and shape best suited to a representation of the noteworthy features.

(*d*) Rock chips suitable for thin sections, for microscopic study, should be inclosed in a small envelope provided for the purpose, and should be marked with the serial number of the corresponding hand specimen. In order that the work of the petrographic laboratory may be properly distributed throughout the year, geologists who wish to have thin sections made are directed to send their chips by small shipments—say 25, 50, or 100 at a time—from the field as soon as the material is collected, instead of waiting until they return to Washington at the end of the field season.

(*e*) It is particularly desirable that rocks submitted for quantitative chemical analysis should be represented in the collection by abundant material. Geologists are urged to consider while in the field the possible need for chemical work, in order that the sample submitted for analysis may be truly representative and that there may be on hand several duplicates of such thoroughly investigated rocks.

(*f*) Where rocks of different composition or texture are united by a transition zone, either of primary origin or marking alteration, it is usually desirable to collect a suite of specimens illustrating the transition. Different numbers should be assigned to different phases.

(*g*) Specimens should present fresh, clean fracture faces, as free as possible from hammer bruises, and care should be taken to avoid staining the specimen through moisture of the hand or in other ways.

(*h*) In localities which illustrate the gradual transition of one

rock into another, series should be collected showing various stages of the change for chemical and microscopic study.

5. *Collection of minerals.*—(*a*) The geologist should not neglect opportunities to collect new, rare, or finely developed minerals, even if they have no important bearing on his work. If the collecting involves much time, he should obtain a few representative specimens, making notes of occurrence and locality, which will be useful to the specialist who may wish to obtain further material.

(*b*) No general rule for the size and shape of mineral specimens can be given. They should represent the best development of the species found, their associations, and the manner of occurrence. Particular care in packing mineral specimens is necessary in order that the time spent in collecting them may not be wasted.

(*c*) Specimens which illustrate the alteration of any mineral, permitting the study of the process of transformation, are of special interest, particularly if pseudomorphs.

6. *Collection of ore specimens.*—(*a*) In the examination of a mine or a mining district specimens should be collected to represent all the varying phenomena of the ore deposits from the points of view of mineralogic composition, genesis, and structural relations. Specimens representing country rocks gathered during the areal survey of a mining district should be made according to the rules already given for rock collections, but the uniformity of size there desired can naturally not be expected to obtain with regard to specimens of ore or minerals.

(*b*) Collections of specimens illustrating ore deposits will be made with the following objects in view: (1) For a working collection for purposes of study in the office or laboratory; (2) for a type collection to be deposited after the study is completed in the National Museum, or in the reference collection of the Survey.

(*c*) For a working collection a full suite of specimens of ores, gangues, and wall rocks should be collected, sufficient to furnish material for a thorough microscopic, chemical, and mineralogic study of the deposits under examination. In these uniformity of size and shape is not so essential, but the specimens should be large enough to show the phenomena or relations they are designed to illustrate. When intended for complete chemical analysis there should be at least 3 or 4 pounds of material. For micro-

scopic examination it is well to break off, in the field, thin chips of appropriate size which will show the phenomena to be studied.

(*d*) For the Museum or reference collection, type specimens should be chosen which illustrate as clearly as possible the important and characteristic phenomena of the deposits, such as the original condition of deposition, the results of oxidation or alteration, and of secondary enrichment. In preparing these more care should be taken to approach uniformity in size and shape. A size of 4 by 5 inches with a thickness of not over 2 inches should be aimed at, but larger specimens may be necessary to illustrate features of mineral association, structure, or relation to wall rock.

(*e*) For specimens illustrating structure or manner of deposition it is important that it should be possible to orient their original position in the deposits. This may be done by putting a red spot on the upper part of the specimen and an arrow, in indelible ink, on its side to indicate the meridian.

(*f*) Care should always be taken to avoid bruising or soiling the faces of specimens during the collection. The specimens should be numbered with indelible ink at the time of collection and be duly described by notes made as soon thereafter as practicable. It is well to assign a letter or letters to a given district and to mark each specimen with that letter and the consecutive number as collected.

7. *Collection of fossils.*—(*a*) In collecting fossils there are reasons in addition to those above given for gathering abundant material. For the purpose of determining the exact geologic horizon of a bed it is important to have as many species as possible and to have each species represented by recognizable examples. These two ideas should be in mind when selecting specimens where transportation facilities are limited, as in reconnaissance work. In more detailed work, even where the formations are well known and their limits recognized, full collections should be made from every fossiliferous horizon of measured sections so far as practicable. The data thus obtained as to the geographic distribution and stratigraphic range of species make future determinations and correlations of horizons increasingly more accurate.

(*b*) All specimens taken from one bed in one locality, though representing many species, should be given the same number and label.

(*c*) As indicated in a previous section, great care should be taken in recording on map and in notebook the locality and horizon where fossils are found. As a rule, fossils collected from different beds, even if only a few feet apart, should have distinctive labels, and specimens found on talus slopes or in bowlders should be kept separate from those found in place. When collections from distinct horizons are mixed, the fossils themselves will usually indicate that fact; but it will often be necessary to revisit the locality for exact data as to stratigraphy and structure that might have been obtained in the first place if the collections had been more carefully made. Wherever possible, a sketch section should be made in the notebook and the exact horizons from which fossils were collected indicated.

(*d*) In collecting fossil plants perfect specimens should be sought for; but fragments that illustrate essential or important characters should also be taken—such as the tip of a leaf, a petiole with a part of the leaf attached, a good, perfect base of a leaf, or a well-preserved portion of the margin. By the comparison of a good series of such fragments, if these are all that can be procured, a satisfactory idea of the form, size, and character of the leaf may usually be obtained. In collecting from Mesozoic or Tertiary formations a fragment of bark, a leaf with no part of the margin preserved, or a mass of leaves without form can usually be discarded at once. On occasion it is of course desirable to take anything in the nature of plant remains, for a few seemingly worthless fragments from a horizon that is rarely plant bearing may often be of more interest than a full collection from a well-known locality or horizon. In any case it is desirable that the collector spend sufficient time to insure a full, or at least a fair, representation of the flora at each locality.

(*e*) In collecting ferns the most valuable specimens are those found in fruit, and nothing, no matter how fragmentary, that shows the slightest tendency to be fruit bearing should be discarded. As ferns and conifers can usually be determined on smaller fragments than will suffice for dicotyledons, such fragments need not be discarded if they are all that are available. Both these classes of vegetation are valuable and should be secured whenever possible. Fragmentary impressions of stems and branches, detached leaves of conifers, lignitized wood, etc., are

usually of little diagnostic value, and may generally be rejected, except in the case of Paleozoic plants, when great care should be given to the collection of impressions of the outer bark, which is especially essential to the specific determination of such groups as the Lepidodendreæ and the Sigillarieæ.

(*f*) When specimens are accidentally broken all the parts should be saved and kept together if possible. Counterparts or reverse impressions should be carefully preserved and also kept together.

(*g*) In collecting invertebrate fossils it should be remembered that the important features for their determination are form, external sculpture, and internal structure. Complete specimens should therefore be obtained if possible, or if the fossils are broken all the pieces should be saved and carefully packed, together with a label indicating that they are parts of one individual.

(*h*) Imperfect specimens that show internal structure or other important features should be collected even if perfect examples of the same species are obtained. Fossils preserved as internal casts are often more instructive than perfect specimens, but in such cases the adjacent matrix showing the imprint of the exterior should also be carefully collected and kept with the cast to which it belongs. When fossils are distorted by pressure larger collections are needed to assist in estimating the amount of the distortion and thus making the determination more certain.

(*i*) In collecting vertebrate fossils, it is of the greatest importance to keep the bones of each animal by themselves, separated from all others, and to save all the pieces, however small. Collect carefully all the loose bones and fragments on the surface or covered with earth, before beginning to dig out the skeleton.

(*j*) Never remove all the rock from the skull, foot, or other delicate specimen. The more valuable the fossil the more rock should be left to protect it.

(*k*) When an entire foot is found, keep the bones of each toe together and separate from the rest; then the foot can be put together again with certainty. A complete foot is often more valuable than a skull.

(*l*) Get all the bones of every good specimen, though it may take much time to dig them out. The absence of a single toebone may greatly lessen the value of a skeleton.

(*m*) When a rare bone can not be got out of the rock entire, it is important to measure its exact length on a piece of thick paper, and pack this, properly marked, with the pieces saved. A drawing of such a bone, however rude, may prove of value.

(*n*) Small specimens are often more valuable than large ones, and should be carefully sought for when a good locality is found. Single bones, if one end is perfect, are worth saving. If freshly broken, look carefully for all the pieces.

(*o*) Every fossil or fragment should be wrapped separately in paper, using sufficient soft paper to prevent all danger of injury by rubbing. Cotton should be used in packing fragile specimens; and each lot that should be kept together, as the fossils from one locality or the parts of an individual, should be put in a sack, or securely wrapped in strong manila paper, with a label inside and a tag or number outside.

8. *Packing.*—Specimens of all kinds should be packed in small boxes, so that they can be handled by one man. Each box should be entirely full, all interstices being filled with soft paper, excelsior, hay, or similar material. The top of the box should be planed and the directions marked with paint or ink. Each box should be bound with wire or otherwise strengthened. Directions for marking and shipping boxes of specimens are given under "Express and freight," page 34.

9. *Opening of packages.*—(*a*) As soon as a box or package of specimens is received at the office of the Survey a storage label will be attached to it, giving the serial storage number, date of arrival, and collector's name. All these items must be entered in the storage book.

(*b*) If boxes are delivered to the National Museum unopened, that fact must also be entered in the storage book.

(*c*) A similar entry must be made if a package is delivered to any person to be unpacked.

(*d*) Whoever opens a package of unnumbered specimens must at once attach firmly to each specimen, if of sufficient size, an adhesive label containing a number referring to the accompanying field label and to a full catalogue.

(*e*) Unnumbered specimens must not be placed in trays with loose labels.

10. *Disposal of collections.*—When a collection of fossils, minerals, rocks, or ores has been received in Washington it should be disposed of by the geologist as follows:

(*a*) Fossils should be transmitted through the geologist in charge of geology to the paleontologist in charge, with separate and complete lists of numbers, localities, and geologic horizons, when possible, of vertebrates, invertebrates, and plants. In this letter of transmittal it should be clearly stated what kind of a report is desired by the geologist for his own use, if any, e. g., whether he wishes determinations of horizons only, lists of species, or discussions of faunas which may be quoted or referred to. Final transfer of such material to the Museum will be by the Director on recommendation of the paleontologist.

(*b*) Minerals intended for the National Museum which it is not the intention of the geologist to describe himself will be officially transmitted by the Director, on the written request of the geologist.

(*c*) Collections of rocks are to be retained in the custody of the geologist until no longer needed for study. It is desired, however, that as soon as possible after the publication of each completed work a thoroughly representative collection illustrating the investigation should be deposited in the National Museum. On the one hand care must be taken to have this collection include all specimens that will probably be needed for future reference, and, on the other hand, judgment must be used to make the collection sufficiently representative without cumbersome duplication. Where thin sections of rocks have been made, a set should accompany the Museum specimens. Duplicate sections may be made to be retained by the geologist if desired.

(*d*) The geologist in charge of the section of petrology will be called upon to approve the selection of each reserve collection of rocks before transmittal. He is also authorized to select rock specimens desired for the petrographic reference collection and to incorporate them in that collection at any time after the report dealing with the specimens in question has been published.

(*e*) The material remaining after the reserve and reference collections have been selected should be carefully sorted over. Small specimens which have served their purpose as study material and can be of no further value may be thrown away. The geologist

may also select a set for comparative studies when he thinks that desirable. The rest of the collection must be transmitted to the Museum for its general purposes. It should be borne in mind that the reserve collection of the Museum is available for examination at any time.

(*f*) Ore collections are to be treated in the same manner as rocks.

11. *Transfer of specimens to National Museum.*—Whenever geologists, paleontologists, and others have specimens or collections of rocks, minerals, or fossils to be turned over to the National Museum as accessions, the Director should be advised of the proposed transfer, and the transfer be made in regular official form by letter of the Director, or of the chief clerk, by his order. In no case should a collection be sent by the geologist or paleontologist direct, whether accompanied by a personal letter to a member of the Museum staff or not. The forwarding of a collection need not necessarily wait upon the sending of the Director's letter of transmittal, but the former may be sent to the proper department of the Museum at the convenience of the geologist or paleontologist, the official letter following in due course.

24. Chemical Analyses.

1. All requests for chemical analyses should be accompanied by full information as to the locality from which the material comes, the nature of the geologic problem involved, and the bearing of the analysis requested upon its solution. This information is for the guidance of a committee on chemical analyses, whose favorable recommendation is necessary before the request can be approved.

2. In the case of petrographic specimens, microscopic study of thin sections and a careful comparison of the rock with already analyzed specimens in the petrographic reference collection should precede chemical analysis. A brief statement of the results of such microscopic study should accompany the request, in order that the chemist may be informed of the presence of unusual constituents or of the abundance of others ordinarily present in small quantity.

3. When waters are forwarded for analysis the entire material must be collected through filters in clean glass bottles or carboys

at one time, so that the entire specimen, measuring not less than 2 gallons, may be thoroughly uniform, and these vessels must be properly sealed with paraffin. Whenever it is practicable, geologists desiring analyses of water should inform the chief chemist of the general character of the water and receive detailed instructions as to collecting and bottling. Ordinary druggists' filter paper is not suitable for the collection of acid waters.

4. State the nature of the analysis desired, giving the elements to be determined whenever a partial analysis only is called for.

The term "complete analysis" is understood to mean the determination of all the elements which occur commonly in rocks, including titanium, phosphorus, barium, strontium, lithium, etc.

5. State whether there are analyses of this or similar material from the same region already printed, and give references.

6. Give the name of the substance to be analyzed, and state the locality on the label accompanying the sample, as well as in the official letter of request.

TOPOGRAPHIC BRANCH.

25. Organization.

1. The topographic branch is organized in two divisions: (*a*) topography, and (*b*) geography and forestry. For purposes of supervision and administrative control the division of topography is divided into four areal sections, each under a geographer in charge reporting to the Director, as follows: (*a*) Atlantic; (*b*) Central; (*c*) Rocky Mountain; (*d*) Pacific. In addition there is a triangulation and computing section. The chiefs of the areal sections constitute an advisory committee to the Director, to which matters pertaining to the topographic branch as a whole are referred. To this committee the chief of the triangulation and computing section and the custodian of instruments report.

26. Primary Triangulation.

1. Signals should be of sawed lumber whenever it can be obtained, and great care must be taken to secure perfect centering of instrument and target over station mark.

2. All stations should be selected with a view to their adaptability to topographic expansion, and when the exact location of a station is decided upon, one of the standard iron posts, copper plugs, or bronze tablets must be set as a permanent mark. In light soil a bottle or similar object must be left as a subsurface mark. These marks should be exactly at the center of the station, and in addition there should be left one or more permanent reference marks.

3. Ends of base lines should be marked as follows:

(*a*) Station mark—a bronze or aluminum tablet, countersunk and cemented in center of top of a stone post at least 48 by 8 by 8 inches, set flush with surface of ground.

(*b*) Reference marks—standard bench-mark posts, set 42 inches in ground, at right angles to base, one on either side 20 feet distant, and one on prolongation of base 20 feet distant; also, azimuths and distances to near-by permanent objects.

(*c*) If a stone post can not be obtained for a station mark a bench-mark post may be used, but it must be set in a cubic yard of concrete and the top be stamped or lettered, to distinguish it from the reference posts.

4. Whenever practicable, set the theodolite over the center of the station while reading angles, to obviate reduction to center.

5. The theodolite when in use must be sheltered from the sun and wind. When setting the theodolite tripod, leave the head-bolt thumbscrews loose until the legs are firmly placed.

6. Never, under any circumstances, attempt to place the circle so that when pointing at any particular station the micrometers will be set to even degrees.

7. Use Book 9–912 for all field records, and do not crowd notes. Have notes plainly written with No. 4 pencil or with ink, and never erase, but draw a single line through erroneous records.

8. On the page immediately preceding the record of angles, write a minute and complete description of the station occupied, giving nearest trails or roads, camping places, station marks, etc., as well as ownership of land when possible. Write this description before leaving the station. In addition, plat a rough diagram of pointings, showing also plan of eccentric location of instrument, if there be such.

9. Before observations are commenced at a station, test all adjustments of theodolite and correct such as are found in error, paying special attention to micrometers to avoid the errors of run.

10. For micrometer theodolites, angles must be measured either by the method of circle readings (directions) or by single angles, and in either case each set of angles must be kept on a single page of notebook. If the method of directions be adopted, each complete set must consist of pointings with telescope direct, and reverse pointings with telescope inverted, always closing horizon. See Monograph XXII for additional details in use of micrometer theodolites.

11. No angle should be considered finally determined that has not been measured on at least five different parts of the circle.

12. The error of closure of any triangle in primary schemes should not exceed 5 seconds.

13. Opposite each angle recorded give any necessary information in regard to visibility of signals or atmospheric conditions.

14. Do not trust to memory for notes. Make all notes as complete as though it were expected another person would compute them.

15. Observations for azimuth on Polaris before and after elongation must be made on two nights from at least two stations for each general locality of work, to consist of not fewer than six angles between mark and star with telescope direct and reversed. See Monograph XXII for form of record in reductions. Great care must be taken in adjusting and leveling the horizontal axis of the theodolite. Watch error must be determined by telegraphic comparison of time or by astronomic observation. The mark should consist of a small box with a slit about one-eighth inch wide and 6 inches long cut in it (having also ventilating holes), the box, with slit toward observing station, to be firmly nailed to stakes driven in the ground and at a distance from the station of at least a mile. At the time of observation a lamp or candle is to be placed in the box. The following day the angle between the mark and one of the triangulation stations should be measured in the usual manner.

16. Angles at each station must be reduced to center of permanent mark in the field in order to test triangle closures. Arbitrary

adjustments and preliminary computations should also be made in the field. All computations, except distances and coordinates, must be in Book 9–889.

17. Keep a careful plot of the work on a scale of 10 miles to an inch, and each month send a copy with monthly report, indicating angles measured by the usual signs.

18. On fly leaf of each notebook write an index of contents of book, and state make and number of theodolite used.

19. The observer should always endeavor to locate prominent points that may be of use to the topographer, or that may be used for future stations.

20. Special attention must be paid to the location of county court-houses, section and county corners, and State-line marks.

21. Useful locations can often be made by the "three-point method," the theodolite being set up for the purpose while going to or from stations.

22. Keep in view the fact that station names are to be published, and select such as have local significance.

27. Primary Traverse.

1. The instruments to be used are a 20″ or 30″ transit; one 300-foot steel tape graduated to feet for 5 feet at either end; one spring balance; one 100-foot steel tape; two thermometers; four hand recorders; two flag poles, and one good watch.

2. The party should consist of: One chief, as transitman; one recorder; two tapemen, either of whom may act as front or rear flagman; and one flagman.

3. At each station the transitman should proceed as follows: Set telescope on rear flag, read both verniers, transit telescope, set on front flag and read both verniers. Shift the circle and remeasure the same angle with telescope reversed. If the two angles thus measured differ more than 60″, repeat the operation.

4. Along a railroad the operation of measuring is to be conducted as follows: The front tapeman puts a 20-pound tension on the front end of the 300-foot tape with a spring balance. He makes a chalk mark on the rail, or places a tack or nail on a tie, stake, or measuring board, under the 300-foot mark for full tape lengths, and under the fractional graduation at stations. The dis-

tance which he records is checked by the transitman, and at least one other member of the party. The tack or nail is left, surrounded by conspicuous chalk marks, and the same process is continued.

5. The rails should be counted by two other members of the party, who also check the number of tape lengths at the first opportunity. Each station should be marked by a small-headed tack or pricking needle through a piece of white paper or cloth, its number being chalked on the rail near where it falls. The distance between stations should be limited to the visibility of the flag poles. Rails or center of track must not be used as alignment sights.

6. Along highways or open country the tape should be kept level. On steep slopes a plumb bob must be used, either to bring the tape vertically over an established point or to establish a new one, as the case may be. Tape lengths are marked on the measuring board, tie, or stake with the pricking needle. Where slopes are so steep as to render the leveling of the 300-foot tape impracticable a shorter tape must be used.

7. The chief and two other members of the party must keep an independent count of tape lengths. The temperature of the tape must be taken every hour in the day. Stations should be made at even tape lengths whenever practicable.

8. Observations for azimuth must be made at close of each day's work when possible, and azimuth stations should be not more than 10 miles apart, except on long tangents.

9. An azimuth observation must consist of not less than three direct and three reverse measures on three parts of the circle between Polaris and an azimuth mark, to be made at any hour, but preferably near elongation, and the place, date, time, and watch error should be recorded.

10. The watch should be compared with standard time often enough to determine its error within ten seconds.

11. Where the line traversed is very crooked the instrument should be fitted for observation of solar azimuths, and these should be made at least twice in each day, weather permitting, in addition to Polaris observations.

12. The record must contain a description of the starting point of the line and the beginning and ending of each day's work; also

location of each railroad station, milepost, and switch passed, and wagon road, stream, land or county line crossed, and connection with corners of the public-land surveys.

13. Two permanent marks, either the copper bolts or the standard bronze tablets of the Survey, should be placed not less than 500 feet apart at the beginning and end of each line, also at prominent junction points from which other primary control lines may be started. A complete description and detailed sketch of these should be entered in the notebook.

14. Permanent marks of some kind should be left at such points passed during cloudy or unfavorable weather as it may be necessary to return to for the observation of azimuths.

15. Observations for magnetic declination must be made at several points in the course of a season's work, especially at county seats.

16. A complete record must be kept by the transitman in book No. 9–905, and a separate record of tape lengths by the front tapeman.

17. The transit notes should be entered and worked up in the following manner:

Station.	Pointings: Back and transited.		Mean pointing.	Deflection angle.	Comp. azimuth.	Remarks.
	Vernier A.	Vernier B.				
	° ′ ″	° ′ ″	° ′ ″	° ′ ″		
392	65 48 00	245 48 00	65 48 00	0 46 00		11 a. m. 72°.
	65 02 00	245 02 00	65 02 00			
100 rails.			65 02 00	0 46 00		76 road crossing.
2,975 feet.	64 16 00	244 16 00	64 16 00			
				0 46 00		
393	64 16 00	244 16 00	64 16 00	4 41 30		12 m. 73°.
	68 57 30	248 57 30	68 57 30			
39 rails.			68 57 30	4 41 30		On road crossing.
1,197 feet.	73 39 00	253 39 00	73 39 00			
				4 41 30		

28. Spirit Leveling.

1. A sufficient amount of accurate spirit leveling will be done to insure the placing of at least two permanent bench marks in each township or equivalent area surveyed, except in forest-clad

and mountain areas and in the region east of the ninety-fifth meridian, where at least one shall be established; and these shall be established, whenever practicable, near the township corners of the public-land surveys. In addition to these, other bench marks should be located in prominent places, where they may be of service in the prosecution of future public or private surveys.

2. For each general locality of field work some centrally situated place will be chosen in which an elevation above sea level can be determined with approximate accuracy from railroad or other surveys. In this place are to be established two central datum bench marks, preferably tablets cemented in some solid masonry structure, to which will be referred all other bench marks in its neighborhood.

3. Permanent bench marks established in the course of the subsequent work should be so located that, like the central datum benches, they will not be liable to injury or disturbance, yet should be so prominently situated that they will be easy to find. They should consist of bronze or aluminum tablets, fastened with Portland cement into solid rock or masonry structures, as the foundations of buildings or bridge piers; or of the standard bronze-capped iron posts, which should be so set in the ground as to project about 1 foot. The intersection of the cross lines is the bench mark.

4. Primary level lines will be run with one or two rodmen and one levelman, and when necessary, a bubble tender. Wherever practicable such lines should be run in circuits which will check back upon themselves or other lines. Where long, unchecked lines are run, two rodmen must be employed and a double-rodded line be run (see page 67, paragraph 32).

5. *Single-rodded lines.*—Levelman and rodman must keep separate notes and compute differences of elevation immediately. As levelman and rodman pass, the former must read the rod himself, record and compare readings, then compute the elevation or H I., and after computations are made compare results with the rodman. No comparisons may be made until the record is complete. If the results differ, each must read the rod before comparing anything but results.

6. Work on primary lines must not be carried on during high winds or when the air is "boiling" badly. During very hot

weather an effort should be made to get to work early and to remain out late, rather than to work during midday.

7. Fore and back sights should be of equal length, and no sight over 300 feet should be taken except under unavoidable circumstances, as in crossing rivers at fords or ferries. In such cases extraordinary precautions must be taken, as repeated readings at changed positions of rod and level, etc.

8. If it is impracticable to take equal fore and back sights, as soon as the obstacle is passed take enough unequal sights to make each set balance. In this case extra care must be taken to insure correct adjustment of the level.

9. Distances along a railroad can be obtained by counting rails, and pacing when rails of different length from the ordinary 30-foot rail are encountered. At other times stadia or pacing may be used according to the quality of the work. The distances in miles of both fore and back sights must be recorded in both notebooks in the proper columns. The pace of the average man is about 2,000 to the mile—thus, if each time the right or the left foot strikes the ground is counted, it will correspond to 0.001 of a mile.

10. The tripod clamping screw must be loosened when the instrument is set, and tightened only after the legs are firmly placed. Always level the instrument exactly before setting the target. After setting it and before giving the signal "all right" examine the level bubble. If found to be away from center, correct and reset target.

11. The level must be adjusted daily, or oftener if necessary. The adjustment of the line of collimation and of the level tube is especially important.

12. Provide rodmen with conical steel pegs, 6 to 12 inches long, with round heads, to be used as turning points. Never take turning points on rails or ties. Always drive the pegs firmly into the ground, and never pin between ties when stable soil or ballast is near, avoiding danger of disturbance from passing trains.

13. When the rod is lengthened beyond 6.5 feet, both the rodman and the levelman must examine the setting of the target as well as the reading of the rod vernier. When the rod is closed see that the rod vernier indicates 6.5 feet, not depending upon the abutting end to bring it back to place. Keep the lower end of the rod and the top of the turning point free from mud and dirt.

14. Plumbing levels must always be used and kept in adjustment, and long extensions of the rod avoided.

15. In long, unchecked, single-rodded lines make two target settings on each turning point, by first signaling "up" or "down" to a setting, which is recorded by the rodman, then unclamping and signaling in the opposite direction to a setting. If the two differ more than 0.002 of a foot additional readings must be made. The rodman should record all readings, using in his computations only the first of the pair adopted, and the levelman the last.

16. The limit of error in feet should not exceed $0.05\sqrt{\text{distance in miles}}$.

17. When errors are discovered as the work progresses they must be reported at once to the topographer in charge.

18. When errors occur they are usually traceable to mistakes of a foot or a tenth of a foot in reading rods. Particular care should therefore be taken in getting these readings correctly.

19. Permanent bench marks along a railroad or highway should, when practicable, be placed outside the right of way. Bench marks on culverts, bridges, etc., are specially liable to removal during changes of the roadbed.

20. Endeavor to so locate permanent bench marks that the observed elevation shall be within one-tenth foot of the marked elevation. The figures of elevation must be stamped well into the metal cap, before the word "feet," and to the nearest foot only; also the name or initial letter of the central datum point after the word "datum."

21. Place permanent bench marks near all important lakes and reservoirs.

22. Leave temporary bench marks at frequent intervals, marked so that they can be easily identified. They may be chiseled on a solid rock, or a nail may be driven in a knuckle cut on the root of a tree, or any other place where the mark will not be disturbed may be selected. One such bench mark should be left for every mile run, preferably near road corners, in order to give sufficient points to which to tie other spirit levels. Make notes opposite all elevations at crossings of roads, railroads, summits, streams, bridges, and in front of railway stations and public buildings, and all such other facts as may aid the topographer in his work.

Mark in large figures in a conspicuous place the elevation to the nearest foot.

23. Stakes are forbidden for temporary bench marks except in country without suitable natural features. They should then be buried and a marker of bowlders or an earthen mound be left near them.

24. Contour crossings corresponding to the interval used should be marked on the ground in such a manner as to be readily recognized by the topographer or traverseman who follows. Preferably the same side of the road should be used for these markings, especially in desert country.

25. Use the regular Survey level books, No. 9–903; keep full descriptive notes on title-page of every book, giving names, dates, etc. Each man should be responsible for his own notebook, and under no circumstances should erasures be made, a single pencil line being drawn through erroneous records.

26. Keep each set of notes separately and independently as taken, paying no attention whatever to other notes except to compare results. If on comparison errors are discovered, correct them only by new observations or computations. All notes must be recorded directly in a notebook; separate pieces of paper for figuring, or temporary records, must not under any circumstances be used.

27. Level men must number their notebooks for each field season consecutively, whether working in one or more localities.

28. Level and rod books must be balanced daily for distances and rod readings. At the bottom of each page and at the end of a day's work, the levelman and rodman must add up the column of foresight and backsight rod readings and apply the differences between the same, with the proper sign, to the original elevation from which the day's work commenced, thus checking the result obtained by the separate additions and subtractions. The check must under no circumstances be omitted, all the figuring to appear on the right-hand page of the book. Side sights, determining elevations, should be put in column marked "Sta."

29. In the description of a bench mark, first give its general location, referred to some points on the line within a few miles, such as post-offices, villages, depots, mileposts, schoolhouses, churches,

fords, ferries, bridges, ranch and farm houses with names, such distances to be given in miles and tenths; then its relative position to near-by objects, such as roads, streams, houses, fences, mile-posts, gates, etc., these distances to be noted in feet. Finally, with reference to the bench mark: If other than an iron post, tablet, or plug, state fully the size of the nail or spike and whether in side, root, or bottom of tree, giving diameter of tree in inches. If other objects, as telegraph poles, are used, describe fully. When stone bowlders are used describe the mark fully, whether chisel or paint. A plan should be made of permanent bench marks in both level and bench-mark description books.

30. Full descriptions of all permanent bench marks and of all secondary bench marks or elevations which may be useful for topographic work, with such sketches as may be needed, should be copied in ink in the bench-mark book No. 9–916 at the close of each day's work. In no case must the copying be allowed to get more than one week behind the field work. If permanent bench marks are not established when the line is first run, spaces should be reserved for descriptions to be added later, thus keeping descriptions in the order in which the bench marks occur. Give at frequent intervals a brief description of line, and when circuits are closed give errors and length of circuits by page references to connecting points. Make a plan of all lines or circuits, using one page near the back of the bench-mark book for each atlas sheet or group of circuits. On the plan indicate the names of a sufficient number of places to readily identify the line. If there are public-land surveys show the position of the line in the township. Alongside of each line give reference to page in bench-mark book where line is recorded. Make descriptions and notes in the following general form, mileage in third column to be continuous for each circuit:

Date: August 14–18, 1901. Line from Clayton, N. Y., along public road via Orleans and Theresa, to Redwood, N. Y.

Leveling's— Book.	Leveling's— Page.	Miles from—	Marked—	Elevation.	Adjusted elevation.	Description.
		Clayton.				
3	2	0	279 Cape Vincent.	278.762	278.762	Clayton, Catholic Church; SW. corner of; on water table, bronze tablet marked "279, Cape Vincent, 1900." (See p. 3, this book.)
3	4	3	261	261	.....	Clayton, 3 miles east of; at four corners, center of roads (line continued east).
3	7	5.7	254	253.806	.....	Orleans, corner of Mead and Main streets; NW. angle of large rock 5 feet from fence, chiseled square.
3	11	7.9	241	241.372	.....	Orleans, 1.8 miles east of; at NE. angle of road to right, large oak tree, nail in root of.
3	14	12.6	266 Cape Vincent.	265.873	.....	Theresa, high school, front face of; on water table, aluminum tablet marked "266, Cape Vincent, 1900."
				265.631	.....	Old elevation of same B. M. (See p. 6, this book.) Closure error, 0.242.

31. The following are samples of descriptions where public-land lines or corners are the most important features:

T. 141 N., R. 64 W.; Northern Pacific Railroad, crossing of east-west line between sections 22 and 24, top of rail.

T. 143 N., R. 65 W., S. 11, NW. corner of; highest point of rock at section corner.

T. 90 N., R. 3 W., S. 28, $\frac{1}{4}$ corner, east side of; SE. corner schoolhouse yard, iron post marked "1090."

32. *Double-rodded lines.*—In running unchecked or single primary lines with two rodmen, they should hold on turning points 10 to 20 feet apart, but each at equal distances for fore and back sights; otherwise the above instructions are to be followed with the following modifications:

33. The instrument must be shaded at all times by a bubble tender.

34. The back-sight points must not be moved until the levelman has set targets on the new fore sights, so that there shall be in the ground at all times two turning points the elevations of which are known.

35. Bench marks left at termination of work at night, or for rain or other cause, should be turning points in the continuous line. They should consist of large wooden pegs driven below the surface of the ground, with a copper nail firmly embedded in the top. One of these pegs is to be used as the final turning point for each rodman. They are to be covered with dirt, or otherwise hidden, their location being marked by sketches in notebooks showing relation to railroad ties, telegraph poles, etc.

29. Secondary Traverse.

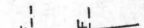
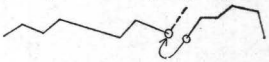
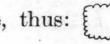
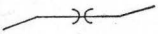
1. Traversing consists of much more than the getting of direction and distance, though these are the absolutely essential features. Next in importance is the drawing of long direction lines for intersection on houses, stream crossings, wood outlines, etc.

2. Traversemen must keep on hand traverse record books 9–896, and on long sights will make a sketch of the road traversed and record the distance to houses, stream crossings, and wood outlines; also show how houses are placed in regard to the road or line of sight, and, as nearly as possible, the angle made by woods and streams with the road traversed, in order that when they make a station these data can be properly transferred to the traverse sheet. This transfer should be made station by station and not left until night or a rainy day.

3. After the traverse is completed as far as the immediate road is concerned, the traverseman should then concern himself with getting locations of prominent objects between roads, as these will aid in adjusting and sketching. Sights should be taken to prominent hilltops, corners of woods, prominent trees, etc., and appropriate symbols should be attached when intersected; thus: ⊙ for hill tops,  for fir trees,  for deciduous trees,  for stumps,  for hilltops with flags. If trees are intersected which are not on hilltops, they should be noted thus:  showing ap-

proximately their relation to the top. If a spur and not the main top is located, represent it thus: 

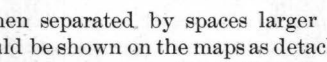
All schoolhouses and churches should be accurately located and represented thus: ⊡ for schools, ☩ for churches. Town, county, and other political or public-land lines should be shown where they cross roads or are otherwise accessible. All small ponds near roads should be traversed to and surveyed, if necessary, on foot. Generally barns or sheds grouped about a dwelling house should not be indicated on the traverse sheet, although as an aid to sketching it is often desirable to note locations of large barns and windmills thus: 

On roads where there are few houses, barns should be noted with symbol: □ Fence lines thus: 
Do not try to make traverses close if they do not properly do so, but show them unconnected, thus: 
Show wood lines and areas by crinkled line, thus:  On roads, or lines of traverse where there is little detail, summits may be shown thus: 

4. Where traverse is run over roads which have been recently leveled, note elevations marked on fences, at summits, bridges, corners, etc., and record same on traverse sheet.

5. Do not have unconnected circuit junctions occur in towns or villages.

6. Houses when separated by spaces larger than the houses themselves should be shown on the maps as detached, even though the full number of houses can not be indicated.

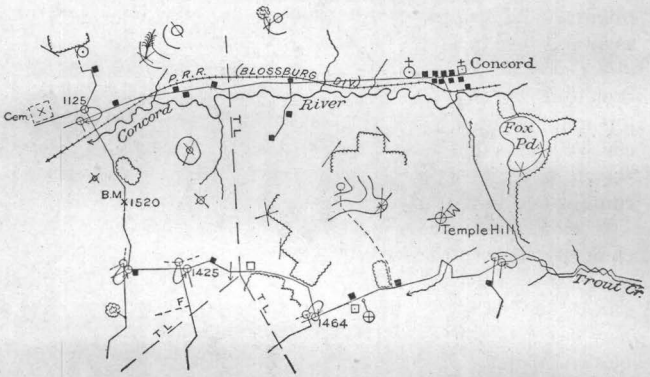
7. Streams should be sketched in near the roads as accurately as the skill and experience of the traverseman will permit. Especially should streams crossing and recrossing roads traversed in ravines or gullies be sketched, and junctions shown with side streams. Thus: 

8. All of the traverse sheet, except that in use, should be kept covered in brown paper, and on the under side of the sight alidade should be pasted a thin piece of cloth or paper. The name of the quadrangle being mapped, and the traverseman's name and address, as well as that of the party chief, should in the beginning be plainly written on the corner of the traverse sheet.

9. Names of villages, streams, hills, etc., should be obtained in the field as far as possible—especial care being taken to get correct spelling—and be written plainly on the traverse.

10. The true measure of a traverseman's ability is the fidelity and correctness with which he shows to scale all the foregoing facts, so that the topographer who follows can go ahead with his sketching without the necessity of correcting location of houses, woods, streams, hilltops, etc., or of retraversing faulty work.

EXAMPLE OF TRAVERSE.



30. Topographic Field Work.

1. At least two primary triangulation points or two primary control lines should be platted on each atlas sheet previous to commencing field work.

2. All existing map material should be diligently sought for; such of this as may be of value, as public-land plats, railroad, water-supply, city, Coast Survey, Army Engineer, or other public

or private material, should be carefully compiled. If on field inspection this proves adequate, it should be brought up to date and incorporated in the field sheets.

3. On each atlas sheet, in addition to primary levels, such other elevations should be obtained instrumentally that aneroids when used need never be left without a check elevation for distances exceeding 2½ to 3 miles. These control elevations may come from profiles of railroads, from spirit levels, or from vertical angulation.

4. Plane-table triangulation must be conducted on the large sheets to a scale of 1:45000 or 1:90000, and it is desirable that as fast as intersections are obtained by the topographer the vertical heights of stations and intersected points should be computed.

5. In conducting plane-table triangulation, as many hilltops, churches, houses, and other notable features should be intersected and located as is possible, in order to furnish the basis of connection with the traverse work, while gaps or passes and salients on ridges should also have their positions and elevations determined as far as possible from the plane-table stations.

6. Secondary topographic control must precede topographic sketching and the filling in of minor details of the map. The topographer should execute plane-table triangulation or run main controlling traverse lines prior to commencing detailed topographic sketching. His assistants may in the meantime be engaged in running additional control or minor traverses.

7. Field sheets must be as few in number and as large as the character of the topography will permit, and all main control must be adjusted thereon; this to be done before the filling in of minor detailed sketching is commenced. These minor details may be obtained by traverse on separate sheets, but must at once be transferred to and adjusted on main field sheets, so that no uncompleted spaces shall be left on them in the field.

8. Elevations should be adjusted between check points previous to sketching. Sketching must be in continuous contours.

9. The stage of water in rivers to be shown on the topographic maps is to be that which exists during the greater portion of the year and represents the normal condition of the stream. When any other condition is represented an explanatory note giving stage and date should be inserted in the legend.

10. The topographer in charge will be responsible not only for the quality of the topographic work but also for the quality and management of the spirit-leveling done under his direction and for the location and marking of the bench marks, each of which he should endeavor to examine personally. Permanent bench marks must all be located on the resulting topographic map and their elevations written thereon.

11. Only so much of the field sheets should be inked in the field as can be done with sufficient care to permit of their being accepted as final drawings and of their being directly photographed or photolithographed (except where land-survey plats are used as field sheets). Accordingly, only such inks should be used as will photograph readily—mixed burnt sienna for contours, Higgins's black for culture, and mixed prussian blue with about one-tenth burnt sienna or orange for drainage.

12. A full record must be made on the title-page of each notebook, stating character of work, locality, atlas sheet, and date of record; also name of topographer and maker of notes. A similar record is to be made on field and traverse sheets, with the addition of scale and contour interval.

13. Plats, on a large scale, should be made or obtained of all large cities, showing the streets and houses in detail.

14. The determination and spelling of names of streams, mountain peaks, villages, and other places of note should receive particular attention.

31. Preparation of Sheets for Engraving.

1. The field sketch sheets, after inking in the office, shall become as far as practicable the field records and final drawings.

2. Field sketch sheets shall consist of half-sheets or quarter-sheets. The paper should be kept as clean as possible, that there may be sharp contrasts between its color and that of the inked lines.

3. The sheets must be inked clearly and carefully, with uniformity throughout, and in such manner as to adapt them for one-third reduction to publication scale. Only such ink should be used as will photograph readily. (See par. 11, above.) Culture should be inked first, and standard conventional signs used.

4. Where it is evident that boundaries follow streams or roads, the former may be omitted when copy would be disguised. When detail would be obliterated by large roman letters the shading should be omitted, leaving the letters in outline.

5. Every fifth contour must be accented, except where the contour interval is 25 feet, in which case every fourth one is accented. Contours are accented by drawing them slightly heavier, not broken or dotted. In close contouring accentuation may be made by increasing depth of color of ink. On steep and uniform slopes intermediate contours—those between the accented ones—should be omitted, except when needed to show detail.

6. In drawing streams care should be taken that the lines shall not become faint and uncertain near the sources of the streams, and the placing of drainage in every little gully simply to indicate that it may be a water course should be avoided. Use the symbol dash and three dots for intermittent streams.

7. In lettering, names parallel to the east or west sides of the sheet should read from the south side. Names of railroads, streams, etc., should always be on the upper side—that is, so that when the map is held in the ordinary position the letters shall not appear upside down. Names should be placed horizontally across the middle of such areas as townships, land grants, and reservations; but in case of narrow north-south strips they should be placed vertically. Names of minor importance and figures of elevation should be placed close to the object, on the right and horizontally. The letters, figures, and cross pertaining to a bench mark should be arranged with the letters above and to the left of the cross, and the figures below and to the right.

8. The standard conventions should be used as far as practicable. When unusual symbols are used they should be fully explained by a legend on the margin of the sheet.

9. Timber and land classification outlines should not appear on the original drawing, but should be submitted on a separate tracing.

10. The original drawing of a topographic sheet shall be verified by some competent person in addition to the topographer who compiles it, by comparison with field sheets, and such "proof reading" shall be recorded on the appropriate form (Record of Proof Reading) and be signed before it receives the approval of the chief of the topographic section for editing.

11. The standard scales for the published topographic sheets shall be multiples of 1:1,000,000, as 1:250,000, 1:125,000, and 1:62,500, for small-scale maps, and for more detailed economic maps multiples of 1,000 feet to 1 inch, as 1:12,000, 1:24,000, 1:36,000, and 1:48,000. The contour interval may be 200 feet, 100 feet, 50 feet, 25 feet, 20 feet, or 10 feet for the first group, and 5 feet, 10 feet, 20 feet, 25 feet, or 50 feet for the second, according to the nature of the topography and the requirements of each case.

32. Magnetic Declination.

1. Diagrams showing magnetic declination to the nearest quarter degree will be placed on all topographic sheets.

2. The magnetic declination will be determined graphically in the field for each quadrangle surveyed by measuring the angle between the true north and the magnetic north as indicated by the needle, using for this purpose the special sight compass. This should be done at all primary triangulation stations and at such other points as may be necessary in order to secure at least one declination in each quarter of the quadrangle.

3. The method of procedure will be as follows:

(*a*) Orient the plane table by placing the edge of the sight compass on the line connecting the triangulation point from which the magnetic declination is to be made and some well-located point on the plane-table sheet, using sight compass as an alidade.

(*b*) Obtain magnetic north by sight compass and, using same edge of compass by which orientation was obtained, draw line through point occupied and extend it so as to intersect the nearest north-south projection line.

(*c*) From a point on the projection line 10 inches north of this point of intersection measure the distance on a true east-west line to the magnetic north line.

(*d*) With this distance enter the table given below of natural tangents and take out the corresponding angle to the nearest quarter degree, checking the angle with a protractor.

Natural tangents for a radius of 10 inches, 0° to 24°.

Angle.	Natural tangents.	Angle.	Natural tangents.	Angle.	Natural tangents.	Angle.	Natural tangents.
Degrees.	*Inches.*	*Degrees.*	*Inches.*	*Degrees.*	*Inches.*	*Degrees.*	*Inches.*
0	0.00	6	1.05	12	2.13	18	3.25
0-¼	.04	6-¼	1.10	12-¼	2.17	18-¼	3.30
0-½	.09	6-½	1.14	12-½	2.22	18-½	3.35
0-¾	.13	6-¾	1.18	12-¾	2.26	18-¾	3.40
1	.18	7	1.23	13	2.31	19	3.44
1-¼	.22	7-¼	1.27	13-¼	2.36	19-¼	3.49
1-½	.26	7-½	1.32	13-½	2.40	19-½	3.54
1-¾	.31	7-¾	1.36	13-¾	2.45	19-¾	3.59
2	.35	8	1.40	14	2.49	20	3.64
2-¼	.39	8-¼	1.45	14-¼	2.54	20-¼	3.69
2-½	.44	8-½	1.50	14-½	2.59	20-½	3.74
2-¾	.48	8-¾	1.54	14-¾	2.63	20-¾	3.79
3	.52	9	1.58	15	2.68	21	3.84
3-¼	.57	9-¼	1.63	15-¼	2.73	21-¼	3.89
3-½	.61	9-½	1.67	15-½	2.77	21-½	3.94
3-¾	.66	9-¾	1.72	15-¾	2.82	21-¾	3.99
4	.70	10	1.76	16	2.87	22	4.04
4-¼	.74	10-¼	1.81	16-¼	2.92	22-¼	4.09
4-½	.79	10-½	1.85	16-½	2.96	22-½	4.14
4-¾	.83	10-¾	1.90	16-¾	3.01	22-¾	4.19
5	.88	11	1.94	17	3.06	23	4.24
5-¼	.92	11-¼	1.99	17-¼	3.10	23-¼	4.30
5-½	.96	11-½	2.04	17-½	3.15	23-½	4.35
5-¾	1.01	11-¾	2.08	17-¾	3.20	23-¾	4.40
						24	4.45

4. The resulting mean from all determinations within a quadrangle will be selected for the diagram, and below the diagram will be placed the words, "Approximate mean declination, 190–."

5. Report each month, under the head of "Remarks," on the monthly report of topographic party, the declination determined, indicating positions of same in the diagram "Area controlled."

33. Cooperation Between Topographic and Geologic Branches.

1. *Collection of geologic data.*—Topographers are instructed to locate in the field, and, when practicable, to determine the altitudes of all features of economic and geologic importance which are visible from their lines of traverse. These features are to be recorded in red on the original sheets, but are not to be engraved on the topographic maps, as follows:

(*a*) All mines, quarries, and open pits of clay and other material of commercial importance.

(*b*) All mineral prospects exceeding 10 feet in depth, and all country coal banks.

(*c*) All deep wells, whether drilled for oil, gas, or water, except where such wells are so abundant as practically to be indistinguishable, in which case only the outline of the pool is to be determined.

2. *Engineering maps.*—On advance request of the geologic or hydrographic branch an engineering sheet will be prepared upon which the above data shall be recorded, together with all points whose vertical or horizontal positions have been accurately determined.

3. *Special work.*—In regions of great economic importance more extended work may be done by the topographers at the request of the geologist in charge of geology, provided that the additional cost of such work shall be paid from the appropriations for the geologic branch.

4. *General reports.*—Topographers should be encouraged to gather, during the regular course of their work, general information regarding the areas surveyed, provided such work is not done at the expense of the topographic mapping. This material should be embodied in written reports under such of the following heads as properly describe it:

1. Engineering report.
2. Geologic report.
3. Physiographic report.
4. Hydrographic report.
5. Agricultural report.
6. Forestry report.
7. Industrial report.

The reports should be submitted to the geographer in charge, who will transmit them, through the Director, to the division to which they pertain, and they will be published or filed for future use over the name of the topographer who prepared them.

34. Location and Representation of Mines, Quarries, etc.

1. With the exceptions noted in paragraph 2 below, all mines and quarries should be accurately located and represented on the topographic maps when they fulfill any of the following conditions:

(*a*) When they are of sufficient importance to be named and the names are well known over a considerable area.

(*b*) When they have been in active operation for a series of years or have equipment which is permanent in character.

(*c*) When they have produced changes in the topography which are within the map scale, such as dumps, sinks, etc.

(*d*) When they occur in a sparsely settled region where there is little culture to be represented, so that they are relatively important as compared with other culture features.

2. In thickly populated mining regions where mines are numerous and closely crowded, only the most important should be represented by the mine symbol and named. Wherever the addition of mine names would materially obscure the map they should be omitted. The matter of determining how many and what mines to represent by the mine symbol, and when to omit their names, is left to the discretion of the topographer. In all cases of doubt, however, he should show the features in question on his field sheets and leave the decision to be made when the final drawing is prepared.

3. By the above conditions all prospect pits, shafts, or drifts would be excluded; also, in coal regions, generally all mines which are worked only intermittently or for the supply of local demands. Clay pits for local use would be excluded, but pits or mines for the supply of regular industries, such as potteries or the manufacture of refractory brick, would be included. In case of iron ore, manganese, bauxite, and similar minerals, certain open pits which have had a large production and have well-known names would be included, while the great majority of shallow pits with small production would be excluded. In general, only such mines and quarries should be represented as are reached by a trail, road, or railroad, traversed in the prosecution of regular topographic work. In other words, the topographer should not be called upon to represent features of this character for which he would have to make a distinct search, but only such as he will be able to see in the course of his ordinary work, except as provided for in section 33.

4. *Furnaces and smelters.*—No additional conventional sign is considered desirable to represent furnaces, and in many cases it will not be practicable or desirable to name them. In sparsely settled regions, however, the furnaces are frequently the most important and persistent landmarks. They have well-recognized

names, which cling to the localities even after the practical disappearance of the furnace itself. In such cases, therefore, it is desirable that the names be given. This should be done even if nothing remains but a ruined stack. The same rule applies to the location of smelters, except that those located may be restricted to smelters in active or prospective operation.

5. *Oil and gas wells.*—In general these should not be represented on the standard topographic map.

6. Whenever a special topographic map of a particular mining region is prepared the topographer will be furnished with a statement of the features which it is desired to have shown and will be governed by such statement rather than by the above regulations.

35. Classification of Lands.

1. All lands hereafter mapped in the course of topographic surveys will be classified as (1) woodland, (2) pasture or grass land, (3) cultivable land, (4) waste or desert land.

2. Woodland will be subclassified as (*a*) merchantable timber; (*b*) tracts containing trees so small in size or of such quality as not to be valuable for lumber, but which may be used for fence posts, firewood, etc.; (*c*) brush, such as chaparral; (*d*) burnt areas.

3. Natural pasture or grass land will be subdivided into two varieties: (*a*) such as may be used for pasturage or cut for hay; (*b*) land which is partly covered with brush or stumps and is indeterminate, being occasionally used for pasturage or cultivation, or having run to young brush.

4. Cultivable land is to be considered as that upon which any kind of cultivated crop, including orchards and seeded hay, is grown; and irrigated land should be distinguished from nonirrigated.

5. Waste or desert land is to be indicated as of one class only, including sand dunes, sea beaches, salt marshes, and steep rocky slopes barren of timber. In the classification of deserts in the arid region particular attention is to be paid to the question of possible irrigation and to the location of reservoir sites.

6. The classifications are to be made graphically, preferably on tracing linen placed over the field sheets. This may be done in pencil on the field sheets, in which event the outlines should be transferred to tracing linen, using colored ink or pencils for each

of the four principal classifications, as follows: Green for woodland; blue for pasture land; red for cultivable land; black for waste or desert land.

7. The graphic classification is to be supplemented by notes. (*a*) Woodland should be described by reference to the principal species of trees and their relative abundance or percentage, distinguishing them by their common names, as pine, fir, cedar, oak, chestnut, maple, hickory, etc.; (*b*) pasture or grass land should be described according to its crop; (*c*) cultivable land should be described according to the predominant character of the crops grown, as forage, grain, small fruits, orchards, vegetables, etc.; (*d*) waste or desert land should be distinguished according as it is sand, rock, alkali, or other barren kind.

8. The information obtained will be published by a combination of colors as overprints on the topographic sheets, with a description on the back of the sheet, and it is expected that great care will be exercised in securing sufficient data for the purpose above mentioned.

36. Monthly Reports of Field Parties.

1. Promptly at the close of every month each party chief will mail a report to his immediate chief on the proper form.

2. For the report of topographic field work, form 9–908 is to be used. A separate sheet must be used for each quadrangle, in order that section chiefs may be able to keep a distinct account of each quadrangle, and thus estimate its quality and cost. For example, in making up reports of field work on three quadrangles in one month, the party chief should apportion the amount of work and the cost among the three report sheets as nearly as practicable, because he is better able to make such a division than are the section chiefs. The total of the three should be accurate, though the details of each may necessarily be approximate.

3. In making up the diagrams on the back of the report sheet, the endeavor should be, where several kinds of work are in progress in one party, to use a separate diagram for each kind. Thus, one diagram should show the area controlled by traverse, distinguishing between kinds of traverse; another, the area leveled, and a third, the area sketched. Frequently it will be impossible so to distinguish the varieties of work.

4. Party chiefs making out reports for primary triangulation or traverse should use the form 9–920, provided for this purpose, and should fill in the various details noted thereon, so far as circumstances will permit. If work was done during the month on areas in different localities, a separate report should be submitted for each area.

37. Editing Topographic Maps.

1. When a topographic sheet is submitted for publication, the chief of the topographic section, or his representative, shall transmit it, accompanied with two photographs or photolithographs on scale of publication, to the Director, for forwarding to the editor of topographic maps.

2. The editor of topographic maps will supply for each sheet a jacket, noting thereon the date of transmittal. He will edit the map and consult with the chief of the topographic section or his representative regarding any changes.

3. When the editor of topographic maps is satisfied that the map is complete and in proper form, he shall indorse the jacket, "approved for engraving," with the date.

4. After correcting combined proof, the editor of topographic maps will submit to the chief of the topographic section, or whoever represents him, the manuscript of all corrections and proofs relating thereto in their jacket, including two extra sets of combined proof, and it shall be the duty of the chief of the topographic section to cause this proof to be read by a competent assistant. One extra proof may be retained in his file set.

5. The chief of the topographic section will return the manuscript and all proofs to the editor of topographic maps, who will consolidate all corrections on the engraver's proof, and, when all questions relating to the proofs have been settled and all corrections made on plates and stones, will approve the sheet for printing.

6. Except the original transmission of the sheet (par. 1), maps going from the chiefs of topographic sections to the editor of topographic maps, and vice versa, may be sent directly.

7. In transmitting manuscript maps and proofs from one division to another, the officer in charge will indorse upon the jacket

the date of transmittal and the purpose for which the map was referred. In those cases in which the material is sent through the chief clerk, in order that the transmittal may be made a matter of record in the central office, a letter of transmittal, to be ultimately placed on file, is also necessary.

HYDROGRAPHIC BRANCH.

38. Organization.

1. The hydrographic branch is organized in three divisions: (*a*) Hydrography, (*b*) hydrology, (*c*) reclamation service. Each of these is divided into sections and districts. The expenses are paid from two separate appropriations—first, that for gaging streams and determining water supply; second, the reclamation fund established by the act of June 17, 1902.

2. In order to simplify operations and prevent confusion of reports and accounts, it is essential that vouchers and other papers be plainly marked either "Gaging streams" or "Reclamation." For economy of administration it sometimes becomes necessary for one man to attend to the records and accounts of expenditure of allotments from both sources, and in such cases it is important to preserve carefully the distinction between the two.

3. The division of hydrography is concerned with the measurement of streams and the determination of the quantity and quality of the water supply of the United States. It is divided into two sections, eastern and western, the latter including the thirteen States and three Territories within which work is being done under the reclamation law. All letters and reports should be addressed to the hydrographer, at Washington, D. C.

4. The division of hydrology has in charge the investigations relating to the geologic conditions which govern occurrence of water underground. A record of deep wells is kept, facts being attained largely by correspondence. Field examinations of the general conditions governing the occurrence of water beneath the surface are also made. The division of hydrology is likewise divided into two sections, eastern and western, the hydrographer in charge being at the head of these.

5. It is not possible at all times to draw a sharp line between the operations of the division of hydrography and those of the division of hydrology, especially in reference to considerations of the quality of waters; but as a rule the former has to do more with the fluctuations of water supply as ascertained by engineering methods, and the latter with the amount and character of water as ascertained by studies of the geologic character of districts and regions.

6. The reclamation service has been organized as a part of the hydrographic branch of the Geological Survey, in order that the experience and information obtained by the men previously connected with the work of the division of hydrography might be utilized. The head of this service, under the Director of the Geological Survey, is known as the chief engineer. All communications, except telegrams, should be addressed to the chief engineer. Telegrams relating to the work of the reclamation service, as well as to the divisions of hydrology and hydrography, should be addressed "Hydrographer, Geological Survey," to avoid confusion in delivery. All replies to correspondence, prepared in the office at Washington, whether signed by the hydrographer, chief engineer, or others to whom specific details have been assigned, should be reviewed by the head of the hydrographic branch or the executive officer, in order that the head of the branch may at all times have full information concerning details.

7. The hydrographer in charge of the hydrographic branch has also been designated as chief engineer of the reclamation service. In the conduct of work he is assisted by an executive staff, from among whom one man, known as the executive officer in charge, is designated from time to time to act in place of the chief, and to sign letters and requisitions and approve vouchers.

8. Each resident hydrographer or district engineer should address all official communications to the hydrographer, or to the chief engineer, and not to any specific individual by name, so that the mail may be promptly opened and receive immediate attention.

9. The officers of the hydrographic branch assigned to duty on the executive staff are concerned with certain details of operations carried on simultaneously in various parts of the country, and act as advisers or assistants in matters of general interest. The officers

assigned to specific districts or States are concerned with the carrying on of operations in these localities, and may have several functions within these areas; that is to say, the district engineer for the reclamation service may also act as resident hydrographer or hydrologist and supervise the measurement of streams or the collection of information concerning the occurrence of underground waters. In such cases care must be taken to keep separate the correspondence and accounts relating to these various matters.

10. The resident hydrographers should give careful attention to the character of stream measurements and their relative importance and value, and particularly to the economical and accurate conduct of the work. They should visit and inspect the river gages at frequent intervals, and see that the observers, especially new ones, read the gages accurately and at proper intervals, and that all assistants, whether permanently or temporarily employed, perform their work in a proper manner.

11. Full reports are to be made each month by all chiefs of field parties to the resident hydrographers or to the district engineers and by these to the hydrographer or chief engineer. Each report should be explicit and should be accompanied by a small sketch or outline map showing the area covered. Careful accounts are to be kept, and from time to time estimates made of the cost of the work as a whole and per unit, as per mile of level or transit line run, or per square mile mapped topographically.

39. Gaging Streams.

1. *Care in stream measurements.*—For detailed instructions on the measurement of the discharge of streams, refer to Water-Supply Paper No. 56, "Methods of Stream Measurement." It is necessary that the greatest care be exercised in connection with discharge measurements, as the records are frequently subject to exhaustive analysis by engineers who have occasion to apply the results, and they are also occasionally called for in court proceedings.

2. *Establishment of stations.*—(*a*) The majority of gaging stations are either at bridges or at cable stations. Judgment should be exercised in the selection of these, especially the latter, as with this type the hydrographer generally has a greater liberty in choice

of location. In measuring the discharge, soundings and velocities should be taken at regular intervals across the stream, say 10 or 20 feet apart; and if at a regular station these intervals should be so marked that measurements can always be made at the same points. If the station is at a bridge, mark the intervals with paint on the hand rail or guard rail.

(*b*) An equipment for a cable station includes the following: For spans under 300 feet, five-eighths-inch galvanized-wire rope with six strands of seven wires each should be used. The cost will approximate 8 cents a foot. For greater spans three-fourths-inch or seven-eighths-inch rope should be used. Eight Crosby clips, costing about 40 cents each, are necessary with each cable; two 6-inch galvanized wire rope pulleys; one turnbuckle, right and left hand thread, with 2-foot capacity; and one gaging car or box, 3 by 4 by 1 foot deep, of common lumber, and painted. The turnbuckle must generally be made to order, of wrought iron, and will cost from $3 to $5. Above the main cable a wire (often the common barbed wire) is supported, to which is attached tin or galvanized-iron tags, marking the intervals at which measurements are made. The tags should be of different shapes—round, oval, or rectangular—with suitable notches, indicating the distance from shore, so that no confusion can arise as to the units, tens, etc. A secondary stay cable, usually of telegraph wire, is to be placed about 200 feet upstream from the main cable, and parallel to it, on which slides a pulley or ring. Attached to this device is a pliable wire passing downstream, to be attached to the meter in time of flood, to prevent it from swinging downstream under the force of the current.

(*c*) Gage rods are marked to vertical feet and tenths. Three styles are in general use: (1) A vertical rod nailed to a bridge pier or firmly fastened and braced to the bank of the stream; (2) an inclined rod following the sloping river bank, but graduated for the equivalent of vertical feet, thus giving a magnified reading; (3) a wire gage placed on a bridge or overhanging support. This latter style should be placed, when possible, in a specially constructed box and fastened with a padlock, as it is often destroyed by theft of the wire or chain. Particular attention should be given to fastening firmly rods that come in contact with the water, in order to prevent their being carried out during flood stages.

Small nails should also be driven into the rod at the tenth and foot marks, so that when the paint is worn away they can be readily seen.

3. *Bench marks.*—A very important feature is the establishment of three or more permanent bench marks, all of which should be above high water, and near the gage, so that the gage can be replaced with its zero mark at the same datum if ever removed. The elevation of the zero of the gage with reference to the bench marks should be checked at least once a year, and more frequently if necessary, especially with the wire gage, as the chain or wire is liable to stretch. Full descriptions of the bench marks should be forwarded to the Washington office, where they will be placed on file for future reference.

4. *Velocity measurements.*—(*a*) After the gaging station is established, if time and expense permit, a study should be made of the point in each vertical cross section of the stream at which the average velocity occurs. This is done by taking velocities at frequent intervals in the vertical section, plotting them on cross-section paper, and determining graphically the point of mean velocity. This study should be made for different stages of the river.

(*b*) Without such a study the general practice shall be to measure the velocity at six-tenths of the total depth for each section, or possibly two-thirds of the total depth, if the hydrographer thinks the conditions are such as to require it. (See Water-Supply paper No. 56, p. 18.) In times of flood it sometimes may occur that only surface velocities can be obtained. If these are measured by a meter, it should be held, if possible, one foot below the surface. The velocities thus obtained should be multiplied by a factor varying from 0.8 to 0.9, to reduce them to the mean velocity. If it appears that the surface velocity represents the maximum velocity, 0.8 should be used; if the maximum velocity occurs at a lower depth, 0.9 should be used.

(*c*) When the velocity in any considerable part of the cross-section of a gaging station becomes less than about one-half foot per second, it is advisable to measure the discharge at some point above or below the station, if a fairly good place can be found where the velocity is somewhat greater than 0.5 feet.

(*d*) When velocity is greater than 2 feet per second, the center of the meter should not be held closer to the surface than 1 foot.

(*e*) As far as possible the hydrographer should visit his stations when the river stage is such as to give a necessary point on the station rating curve.

5. *Computation of discharge.*—(*a*) To determine the discharge, divide the length of the cross section of the stream into a number of equal partial lengths, l (usually 10 or 20 feet). Measure the depth and velocity of the water at the ends of these lengths. Let a, b, and c be three consecutive depths, and v the mean velocity determined at the middle point, whose depth is b. The area of a partial section extending a distance of one-half l on each side of this point will be its mean depth multiplied by its length l. The mean depth is equal to

$$\frac{1}{4}\left(\frac{a+b}{2} + 2b + \frac{b+c}{2}\right) = \frac{a+6b+c}{8}$$

and its discharge will be:

$$l\left(\frac{a+6b+c}{8}\right) \times v$$

(*b*) The discharge of the entire section will, of course, be the sum of the discharges through the partial sections.

(*c*) The hydrographer should check his discharge measurements before sending them to Washington by plotting them on cross-section paper and comparing them with the rating curve for the previous year.

6. *Reports.*—(*a*) The description of a station when first established should be given on form 9–197, and be forwarded to the Washington office. In addition a sketch should be sent showing the relation of the station with respect to any tributaries in the vicinity, and also the relation of the station to the gage rod, bench marks, etc. The field notes of gagings should be made in notebooks, form 9–198. Reports of discharge measurements should be made on form 9–221.

(*b*) In the case of measurements otherwise than at regular stations each card should be marked "Miscellaneous." When such a measurement is made, a temporary bench mark for the elevation of the water at that stage should be established—for instance, the height from the water surface to some point on the bridge or to an overhanging trunk of a tree. It has often happened that

regular stations have afterwards been established at points where such miscellaneous measurements were made, and with a bench mark the early gagings could be referred to the rod of the regular station.

(*c*) The daily gage-height records should be kept in notebook, Form 9–175, and reported each week on Form 9–176 and forwarded to the resident hydrographer. These reports should be carefully examined, and if there is more than one observation a day the average should be given in red ink. Any doubtful records also should be marked before sending to the Washington office, in order that the records there may conform to those in the possession of the resident hydrographer.

(*d*) At the end of each month every resident hydrographer should send a list of the stations under his care, with notes for each on the following: First, if any gage heights are missing for the month, give the dates and reason thereof; second, the number of discharge measurements made during the month; third, note what stations have been discontinued, giving the date and reason for such action; fourth, note new stations and dates of establishment; fifth, give a list of miscellaneous measurements made during the month.

(*e*) Promptly at the end of the year each resident hydrographer will work up his own rating curves and tables and forward them to the Washington office, where they will be checked and inquiry made regarding any discrepancies. The application of the table, also, will be made here, as it is mostly mechanical work, and special facilities in the way of adding machines are available. The tabulated results, in manuscript form, will be sent to each resident hydrographer for his examination before they are published. The only exception to this rule will be in cases of streams with sandy or shifting bottoms, where the rating curves can not be directly applied, and where the hydrographer, because of his personal knowledge of the behavior of the streams, can interpret the records. In such cases the hydrographer will apply his own tables.

(*f*) All notebooks should be carefully checked, indexed, and sent to the Washington office at the end of each year, unless the hydrographer desires to retain them for some special purpose, in

which case a full statement of the facts should be made. The observer's gage-height books should be obtained by the hydrographer on making an inspection trip shortly after the end of each calendar year, the old book being signed by the observer and hydrographer, and a new book begun by copying from the old to the new all the observations made since January 1.

7. *Observers.*—(*a*) In employing observers, great care should be taken to test their ability to read the gages, and to explain all details of recording in the note books, copying the cards, and noting all unusual occurrences. They should be warned especially not to insert gage heights which have not been actually observed. If any interpolation is made it should be done by the resident hydrographer, and then only when accompanied by an explanation, the interpolated figures being indicated in some manner different from those which have been read. The observer should take the book with him when he visits the gage and insert the reading on the spot; all readings should be copied on a postal card at the end of each week and the card mailed, usually to the resident hydrographer.

(*b*) The observer's book should be signed at the end of each month, and when it becomes worn, or after a year's record is complete, a new book should be started, preferably on the 1st of January.

(*c*) If mud accumulates around the gage, the observer should promptly notify the resident hydrographer if he cannot remove the accumulated material; he should, under no circumstances, attempt to move the gage. When, during the winter, ice prevents reading, it should be chopped away from the gage before a reading is made, and if the river is covered with ice the fact should be noted.

(*d*) When rivers freeze, it is usually preferable to discontinue daily observations, and to make weekly reports, showing in a general way the condition of the stream and the height of the surface of the ice and its thickness; the time when it forms and when it breaks up should also be noted.

40. Reservoir Surveys.

1. *Limit of possible error in survey.*—The survey of a reservoir site should be made with sufficient accuracy to determine the approxi-

mate capacity of the reservoir and contents of the dam, so that an error of estimate based thereon shall not exceed 10 per cent by reason of defective surveys.

2. *Reconnaissance.*—Before undertaking the survey of a reservoir site, it is necessary to obtain a somewhat definite idea as to the probability of its proving available, from a physical point of view, for the construction of a dam and the storage of water. In many cases this can be done by an inspection by a competent engineer with the use of a hand level. Where this can not be done, on account of the obscurity of topographic features or for any other reason, it may be necessary to make an instrumental reconnaissance in order to determine the advisability of the proposed survey, and such an examination should not occupy more than one or two days.

3. *Preliminary surveys.*—(*a*) All preliminary surveys of reservoir sites shall be made by plane-table methods, except where the site is densely wooded, in which case transit and stadia methods should be used. A party for making a survey of a reservoir site usually consists of one topographer, one station assistant, one or two rodmen, and a man who can act as cook and general assistant about camp.

(*b*) One or more permanent bench marks shall be established near the proposed dam site, and the elevation be determined with reference to the river bed or water level, and a line of levels shall connect the bench mark with the top contour of the survey. Wherever practicable this bench mark should be connected, by a checked line of levels, with a permanent bench mark of the topographic branch of the Survey, in which case all elevations shall be referred to mean sea level. A line of levels also shall be run up the valley of the reservoir, stakes being driven and flags erected at every point where a 10-foot contour crosses the line. If the reservoir be wide, or timbered, so that angle connection can not be made frequently and conveniently with these contour crossings, points on the top contour shall also be established with the Wye level.

(*c*) A base line of such length and so located that a well-conditioned graphic triangulation may be expanded from it shall be measured in duplicate by a steel tape, and from this base line a careful plane-table triangulation shall be executed. Before beginning

the triangulation all triangulation stations shall be marked by artificial signals. Where the reservoir site, on the scale adopted, covers more than three consecutive plane-table sheets, all the angles of the triangulation system shall be measured by a transit or theodolite reading to 20 or 30 seconds, and the relative positions of the stations be computed and plotted on the plane-table sheets before beginning the plane-table survey.

(*d*) Secondary points for the control of the sketching shall be located by the stadia method. Hills, buildings, lone trees, or other recognizable objects shall be utilized as far as available, and be located by intersection. Secondary points should be skillfully distributed so as to establish controlling points in the topography, such as change of slope, important junctions or bends in drainage lines, hills, passes, etc. A careful search should be made for land-office corners, and all those found should be located accurately on the plane-table sheets.

4. *Transit survey.*—Some cases may occur where the reservoir site is so densely wooded as to absolutely prohibit any field sketching and necessitate the cutting of lines for all sights and the locating of a very large number of points to establish the contours. In such cases the transit and stadia method should be used. Generally the method used is to run a traverse line up the valley of the reservoir site, and one along the top contour of the survey; and where the site is not too large points on these lines may be connected by traverse lines, differences of elevation being obtained by the hand level and distances determined by pacing. Where the reservoir is large it will be necessary to run these traverse lines by transit and stadia.

41. Route Surveys of Streams.

1. Stream surveys are frequently made to determine the grade and character of the stream and its fall, with a view to ascertaining its availability for development of water power and for the storage of water. Where practicable, such surveys will be made in cooperation with the topographic branch. These surveys will include a careful level line, either primary or flying, according to circumstances (sec. 28, pp. 61–68), and a careful stadia traverse of one bank of the stream (sec. 29, pp. 68–70), with intersections or stadia

distances to the other bank, and careful contoured topography to show the islands in the stream, rapids and shoals with their elevations, contour crossings, and in general the topography of the valley bottom, so as to indicate its availability as a storage reservoir, and especially, in narrows, the possibility of the same being used as sites for water-power or storage dams.

2. Intermediate elevations must be taken at the tops and bottoms of all rapids and falls and for contour crossings; also occasionally at extreme high-water and low-water marks, as determined from indications and conference with residents. Permanent and temporary bench marks are to be frequently left as required in section 28.

3. The topographic sketching which accompanies the traverse should, unless otherwise directed, be done on a scale of 1:22,500 or 1:45,000 with contours of 10 feet interval. The contour crossings of the streams should be carefully located, in the arid region at mean low water, in the humid region at mean water stage—that is, mean of high and low water. Contouring should be carefully conducted at narrows for possible dam sites, and extended in flats so far as can be seen from the sketching position.

4. Careful notes should be kept in the notebooks of the character of the country, amount of habitation and kind of culture, vegetation, and soil or rock at narrows—in fact, concerning everything which will aid in the preparation of a brief report as to the water resources of the stream meandered.

42. Surveying Irrigable Land.

1. The same general methods prescribed for topographic field work (pp. 56–81) shall be used in surveying irrigable land under a proposed canal line. Where no primary triangulation exists it will be necessary to measure a base line and expand the plane-table triangulation from it. As in the case of reservoir surveys, where the area covers more than three consecutive plane-table sheets an instrumental triangulation should be made with a transit or theodolite.

2. The scale of field sheets shall not be less than one-half mile to an inch, and the contour interval not greater than 10 feet. As in reservoir surveys, connection should be made with all land-office corners.

43. Triangulation.

1. Where it is necessary to measure the angles of a system of triangulation for the control of the topography of a large reservoir site or of a large area of irrigable land, and where the instrument used reads to 20 or 30 seconds, the following method is generally of sufficient accuracy:

The signals are supposed to be in the order A B C - - A.

First set. { Telescope direct—read on A B C - - A.
Telescope reversed—read on A - - C B A.

Second set. { Shift the limb 90°.
Telescope reversed—read on A B C - - A.
Telescope direct—read on A - - C B A.

If more than two sets are necessary the limb should be shifted, between sets, 180° divided by the number of sets.

In all cases read both verniers.

Each set is complete in itself.

Observations on Polaris for azimuth should be made at the beginning and end of the triangulation.

The triangulation should be adjusted by the method given in "Johnson's Surveying."

44. Leveling.

For instructions for spirit leveling see page 61.

45. Classification of Land.

For instructions for classification of lands see page 78.

46. Canal Surveys.

1. Party organization for a preliminary survey will usually consist of one chief of party; one transitman and levelman, or locating engineer; one plane-table man, and the necessary rodmen and camp assistants.

2. The chief of party will give the general location of the line after examination of the country with aneroid barometer from 10 to 15 miles ahead of the work as it progresses.

3. The locating engineer will place stakes with a level along the line of the canal, estimating approximately the grade. These

stakes should be placed from 300 to 400 feet apart, and be marked with a consecutive number and elevation. Distances between the stakes should not be measured in this first step, but should be estimated. The second day's work of this party will consist in locating the stakes with transit and stadia, running an azimuth line in preference to deflection angles. The organization of this party will consist of one locating engineer, one rodman, one stakeman, and axmen if necessary. The transit notes will be platted in camp from day to day as the work progresses, on a long roll of detail drawing paper, and generally on a scale of 100 feet to the inch. The platting is to be done with chords of angles or with tangents of angles. These platted points are then to be transferred to plane-table sheets by placing the said sheets under the drawing paper and pricking through with a needle point. Points thus transferred are to be marked with the consecutive stake number and the elevation. These sheets are then taken into the field by the plane-table man, and the topography in 5-foot contours is mapped with alidade and stadia for a distance of 300 to 500 feet on both sides of the line. The sheets should overlap an inch or two at the most convenient angle, at or near the left side of the lower sheet, so that the line and the topography may be continuous when the sheets are superimposed in their proper order, at any time in the future. In this method the topography will always extend to the edge of the upper sheet, and it will be necessary at times to have both sheets on the board at once, until the junction of lines and topography is effected, when the upper sheet may be filed away and work continued on the next sheet. The organization of this party will consist of plane-table man, rodmen, and one station assistant, who will keep notes and work up the elevations and horizontal distances from the vertical angles and stadia distances.

4. The level work shall be of the same degree of accuracy as required by the regulations of the topographic branch. Permanent bench-mark posts shall be established on the line of survey at intervals not greater than 3 or 4 miles, and, wherever practicable, be connected with the bench marks of the topographic branch. Temporary bench marks should be established not more than a mile apart in open country and every 1,000 feet in rough

or broken country. Connections should be made as often as possible with the located corners of the public-land surveys.

5. A system of triangulation should also be carried along with the survey, with sides of triangles from 1 to 5 miles in length. The chief of party can execute this triangulation on alternate days when the transit is not being used on the canal line.

6. Monuments for the signals should be fairly permanent, consisting of mounds of rocks with flagstaffs on them or tripods surmounted with flags and staffs.

7. Observations of Polaris should occasionally be taken as the survey progresses, in order to check the azimuth of the line. These observations, if possible, should be made at a station on the line from which three or more triangulation signals are visible, and the angles between these signals and the azimuth mark be measured.

8. Where only a hasty reconnaissance can be made of the canal line, the topography, instead of being mapped with a plane table, may be sketched in a notebook, only one man, with hand level, being required for that purpose. He will generally keep up with the transit party.

9. Along canyon sections the scale of 400 feet for the plane-table work will be hardly large enough, and if an accurate estimate is desired a larger scale of 200 or 100 feet to the inch will be necessary. Experience has shown that through open country, with the recommended scale of 500 feet, the plane-table party can generally keep up with the locating party by the method of work adopted by the latter—that is, running the levels one day and then locating the same line with transit the following day.

47. Borings.

1. Borings, or soundings for bed rock, will be undertaken after authorization by the chief engineer or the principal engineer, their object being to determine the depth to bed rock, or character of foundation, at a proposed dam site, and in some cases along a proposed canal line.

2. The organization will consist of one chief of party, one foreman or diamond-drill expert, laborers, and camp assistants. The chief of party will give the location for the holes, determining the

same by measurement with a steel tape; he will also keep all records and see that they are in proper shape for interpretation by others. For this purpose a special notebook, Form 9–259, should be used. His duties will include also camp management and the employment of men.

3. The foreman will generally be a man of a number of years' experience in diamond-drill prospecting, and he will have charge of the boring work. Machinery for the boring outfit will generally be ordered by the principal engineer.

4. Two styles of hand apparatus are in use by the Survey for driving pipe—the Pierce rig, and the machinery adapted to the hydraulic jetting method. Steam machinery is used on large investigations where practicable. The pipe in use is from 2 to 3½ inches in diameter; grade, double extra strong.

5. A careful record of the material encountered when driving pipe should be kept, and samples collected and shipped to the Washington office in small canvas bags or in bottles. Diamond-drill cores should be carefully saved and placed in suitable trays for shipment to the Washington office. All samples should be carefully marked with the corresponding depths from which they have been obtained, as well as with the line letter and the number of the hole.

48. Standard Scales for Topographic Work of Reclamation Service.

1. *Fifty feet to an inch.*—This is the standard scale for the survey of dam sites. A large majority of such sites can and should be surveyed on this scale. In a few cases, where the survey of the site will occupy more than one entire plane-table sheet and where the detail of the topography is not great, a scale of 100 feet to an inch may be used. The contour interval will ordinarily be 5 feet, and a smaller interval should be used on comparatively level ground.

2. *One hundred feet to an inch.*—This is the standard scale for contour work to be used in making final locations and estimates of cost of canal lines, and is deemed sufficiently large for all such purposes. In some cases, where the country is particularly smooth and free from detail, a smaller scale may be employed. The contour interval will ordinarily be 5 feet, and a smaller interval should be used on comparatively level ground.

3. *Five hundred feet to an inch.*—This is the standard scale for the survey of reservoir sites which can easily be made on one plane-table sheet. Larger reservoirs will be surveyed on a smaller scale. The contour interval of all reservoir sites will ordinarily be 10 feet.

4. *One thousand feet to an inch.*—This is the standard scale for all reservoirs which exceed 2 miles in any dimension, and will be used on most reservoir sites. It will also be used occasionally in extended surveys which are intended for a general study of the location of canal lines and other irrigation works. The contour interval will ordinarily be 10 feet, though in exceedingly steep country this may be increased to 20 feet where this interval will correctly portray the topography.

5. *Two thousand feet to an inch.*—This is the standard scale for the survey of valley lands destined for irrigation. For such purposes the contour interval will usually be 5 or 10 feet, depending upon the slope. It will also be the scale ordinarily employed for areal topographic work intended to show large tracts of country upon which to make a general irrigation study for the preliminary projection of irrigation works. In such cases the contour interval will be 10 or 20 feet, depending upon the character of the topography to be shown.

6. The engineer in charge of a particular piece of work will determine which one of these scales and contour intervals should be employed, being guided by the above general rules. In case he is convinced that some scale other than the five standard scales is more suitable, he will communicate the fact to the chief engineer, giving his reasons and requesting authority for the use of some other scale.

49. Withdrawal and Classification of Lands.

1. In reporting withdrawals for irrigation projects the engineer should, so far as possible, designate for withdrawal the land to be covered by any reservoir which may be needed in connection with the project. The withdrawal for reservoir purposes will be distinct from that required for irrigable lands, and will prevent the making of entry of any kind. Even if the outline of the reservoir

can not be accurately determined an attempt should be made to designate by sections the land to be withdrawn for that purpose.

2. One of the most essential parts of the work of preliminary investigation for an irrigation project to be constructed under the reclamation act is to make a record of the amounts of water diverted by the various ditches taking water from the source of supply to be affected by the Government work; also the maximum capacity of each of the ditches or reservoirs in use. Any information relating to legal decisions concerning water rights, and the best source of information concerning this subject, will be of great value in subsequent investigations.

3. In describing lands the following general rules should be observed. The quarter sections should be placed in the following order: NE, NW, SE, and SW. Always insert "and" before the last subdivision of each section. Lot numbers should be given first and half sections should come last. The following will serve as a specimen for arrangement, order of description, and punctuation. Always give the principal meridian and State.

T. 1 N., R. 1 W., S. B. M., California.

Lots 1 and 2, SW.¼ NE.¼, S.½ NW.¼, and S.½ ..... Sec. 1
NE.¼, E.½ NW.¼, N.½ SE.¼, and SW.¼ ..... Sec. 5
Lots 1, 2, 3, and 4, SE.¼ SW.¼, and E.½ ..... Sec. 18
SW.¼ and N½ ..... Sec. 20
All ..... Secs. 23, 24, 33, and 35

4. When engaged in making a reconnaissance or preliminary survey for a reclamation project the engineer should endeavor to avoid publicity concerning the details of the project, and especially the land which may be temporarily withdrawn pending survey.

5. It usually takes two or three weeks for the order of withdrawal to reach the local land office after the request has been made by this office. If the information becomes public before the order of withdrawal reaches the local land office speculative entries may be made in large numbers and difficulties may result.

6. Upon the completion of his examination the engineer will report fully, with his recommendations and reasons therefor. If

he recommends the withdrawal of lands, all tracts that can possibly be irrigated under the project should be included. The land included in a preliminary withdrawal of this kind may be described by entire townships.

7. As soon as the extreme height of the dam for a reservoir can be determined the highest water line should be run out and accurately connected with the public surveys.

8. The engineer will thereupon forward to the chief engineer a list of the lands which will be covered by the dam, the head works, and the water of the reservoir at the highest level, allowing for a marginal strip of 100 feet outside of the land actually covered; a wider marginal strip may be allowed for in places where it will be necessary to control more land for the proper maintenance and protection of the reservoir and head works.

9. When the survey of the irrigable lands has proceeded sufficiently to enable the engineer to determine the lands which can not be irrigated under the proposed works he should forward to the chief engineer a list of the lands to be excluded from the preliminary withdrawal, in order that they may be restored to entry.

10. The descriptions of lands for reservoir sites and for restoration to entry should be such as to designate them by smallest legal subdivisions—that is, 40-acre tracts or lots. They should, however, be consolidated as much as possible, using whole sections, or quarter sections, or half-quarter sections where possible, instead of the separate quarter-quarter sections.

11. Where the public-land surveys have not been extended over the lands in question, but are not far distant, it will be advisable to project the public-land surveys, making liberal allowance for possible variance in the final Land Office surveys. When the public-land surveys are at a considerable distance the descriptions should be made with a view to their being platted on the State or Territorial maps issued by the General Land Office.

12. The fact that any tract is included in one of the so-called "school sections" should not prevent a recommendation for its withdrawal, because the status of such lands depends upon a variety of conditions, and the decision in the matter must be left to the General Land Office.

13. Topographic maps of irrigable lands should show, in addi-

tion to the topography, a classification of the lands. Notes should be made of the character of the soil, vegetation, etc., including information as to the areas covered by timber, wood, and brush.

14. With reference to irrigability, the land will be divided into two general classes, irrigable and nonirrigable. This can be best done on a piece of tracing cloth, showing the public-land subdivisions by 40-acre tracts or lots, which is placed over the map. Irrigable land will be classified as first, second, and third class. By nonirrigable or worthless land is meant land that is too rocky, too broken, or too full of alkali (shown by black or white deposits) to permit of agriculture. On the tracing cloth the classification should be indicated in colors; nonirrigable or worthless land should be colored in red, first-class irrigable land in green, second-class in blue, and third-class in black, these colors all to be shown by pencils of the appropriate color. The land under cultivation at present should be shown in its appropriate color with fine black lines drawn across. In addition to the color sheet there should be detail notes kept, recorded in notebooks No. 9–896, describing the soil, topography, and vegetation of the various subdivisions on the tracing, the subdivisions being referred to by numbers.

50. Classification of Material.

1. On all surveys of dam sites and of canal lines upon which estimates are to be made care should be taken to ascertain the character of the material to be moved and to indicate upon the map the class under which it falls. This classification will depend to some extent upon local conditions and should be explicit. The following classes and descriptions have been adopted as standard for the guidance of engineers, and may be modified by the engineer in charge when conditions render it necessary:

(*a*) *Earth.*—All material that can be plowed by an average 8-mule team, well handled, attached to a suitable breaking plow; also all loose material that can, without plowing, be loaded into a scraper by two men.

(*b*) *Hardpan.*—Indurated earth, sand, or gravel which can not be plowed, but requires loosening by powder and can then be removed by scrapers.

(c) *Loose rock.*—All detached masses of rock more than 2 and less than 10 cubic feet in volume, and all slate or other rock soft or loose enough to be removed without blasting.

(d) *Solid rock.*—All rock not included above which requires drilling and blasting.

51. Maps and Drawings for Hydrographic Papers.

1. The paper used for field work should be of such tint as to furnish a good photograph when completed. For this purpose a brown tint is to be avoided, and a bluish or cream color is desirable. In inking the sheets care should be taken to use ink that will photograph; use prussian blue with a slight addition of burnt sienna for the drainage, and burnt sienna for the contours. Lettering should be legible, but no expense should be incurred for artistic or showy titles. The description of each sheet should be clearly written at the bottom, and the names and dates be inserted, so that no possible mistake can arise in future years as to the precise location of the survey, by whom made, and when. Every fifth contour should be dotted, for convenience in reading the map. Field sheets should be inked as soon as possible, lettered plainly as far as essential features are concerned, signed in ink, dated, and sent to the Washington office to be photographed.

2. It is not desirable to attempt to redraw field sheets and combine them into one large drawing; it is preferable to preserve the maps as separate sheets, combining the photographs whenever necessary to use them together. The drawing of large maps which must be rolled is to be avoided whenever practicable.

3. In the preparation of maps and drawings the object of the drawing must be borne in mind. If likely to be used as an illustration in future publications, the first item to be considered must be the form of publication.

4. *Text figures.*—It is desired to confine the reproduction of drawings as far as possible to text figures. The standard width of text for the Water-Supply Papers and the annual report of the reclamation service is $4\frac{3}{8}$ inches. Text figures may be of any width up to that limit and of any height up to $6\frac{3}{4}$ inches. The character of work on drawings to be inserted in the text must

therefore, be such as will give good results when reduced to these dimensions. The limiting dimensions of drawings for text figures should be made some simple multiple of the sizes fixed for the text figures, as given above—preferably, for convenience, twice or three times—that is to say, a drawing for a text figure should have no projecting parts exceeding in width twice or three times $4\frac{3}{8}$ inches or exceeding in height twice or three times $6\frac{3}{4}$ inches. Drawings, such as elevations and sections, which can not be reduced to the width of a single text figure can frequently be cut in two, making two text figures facing each other on opposite pages.

5. *Plates.*—Besides figures printed with the text, it is allowable to use inserted plates. These should be avoided as much as possible and their use restricted to the larger and more important drawings in which there is so much detail that they can not be reduced to the size of text figures. Plates are not only more expensive than text figures, but they sometimes delay the publication. While text figures can be used with comparative freedom, care must be exercised in using plates.

6. An inserted plate should be exactly $7\frac{1}{2}$ inches high between neat lines, and may be of any width if it is to be folded. If a double-page plate, mounted in the center, the width between neat lines should be exactly $9\frac{3}{8}$ inches. If wider than this the plate can be mounted on one side and have several folds. Original drawings for reproduction as plates should be prepared for reduction to either two-thirds (one-third off), one-half, or one-third the original size of the drawing. Thus a drawing prepared for reduction to one-third of original size, to make a double-page plate, should have limiting dimensions between neat lines just three times the size of the plate, or $22\frac{1}{2}$ inches high by $28\frac{1}{8}$ inches wide. As far as possible all drawings, whether for text figures or plates, should be made so that they will stand upright on the page, thus obviating the necessity of turning the book around in order to inspect the figure or plate.

7. *Standard sizes and reductions.*—The following are standard sizes adopted for drawings:

(*a*) Text figures: For one-half reduction, limiting lines $8\frac{3}{4}$ inches horizontal by any size up to $13\frac{1}{2}$ inches vertical. For one-third

reduction, limiting lines 13¼ horizontal by any size up to 20¼ inches vertical.

(*b*) Plates: For folded plates, for reduction to two-thirds size (one-third off), limiting neat lines 11¼ inches vertical and any necessary width; or, for reduction to one-half, 15 inches vertical and any necessary width. For double folded plates, for reduction to one-half, limiting height between neat lines 30 inches with any required width; or, for reduction of one-third off, 22½ inches in height with any required width.

8. For simplicity and convenience it is desired that the above standard sizes and reductions be adhered to as far as possible, scales being selected for the drawings which will bring them within the necessary limits. In selecting a scale for a drawing care should be exercised that it be adequate to the amount of reduction in view. The size of all lettering should also be carefully proportioned to the proposed reduction. That is to say, in making an original drawing which will be reduced to one-half size when reproduced, the draftsman should make all lettering, figures, etc., just twice as large as they are to appear in the finished illustration, plate, or figure; if the reduction is to be to one-third, then all lettering, figures, etc., should be three times the size.

9. It is recommended that, as far as possible, all drawings be made on Strathmore board No. 11, size 23 by 29. The whole sheet can be used for drawings for large plates, and it can be subdivided for smaller drawings and text figures. Four drawings of double size for text figures—namely, 8¾ inches in width and not to exceed 13½ inches in height—can be conveniently drawn on a single sheet of this board.

10. In the case of larger maps and working drawings not likely to be used for illustration purposes the principal considerations are that the work be such as will give good results when photographed and that the sheets be made of such size as to be conveniently filed.

11. Uniformity in all possible particulars is greatly to be desired. The general style of drafting work on all maps and drawings should be such as will give good, clear results when reproduced by photographing. Very fine lines should be avoided, and all

lettering, figures, etc., should be plain and open in style and of sufficient size to meet the requirements of the reduction in view. Blue ink and other colors which do not give good results when photographed should not be used. Blue paint gives good results and can be used in place of blue ink.

12. For uniformity and convenience in reference, filing, etc., a standard form of title has been adopted. The essential points should appear in every title; for example: "Reclamation service, U. S. G. S."; the name of the project involved and the State; the particular subdivision or detail of project to which the drawing has special reference; location by township and range, if appropriate; the name of the engineer or draftsman responsible for the map or drawing, and the date of the drawing or survey. A bar scale should also be drawn on each map or drawing.

SALARY TABLES.

52. Monthly Salary Tables.

Table for payments by the month, or fractions thereof.

[Month of 29 days. Rates from $15 to $40.]

	$15	$16	$17	$18	$19	$20	$25	$30	$35	$40
Days.										
1.....	.52	.55	.59	.62	.66	.69	.86	1.03	1.21	1.38
2.....	1.03	1.10	1.17	1.24	1.31	1.38	1.72	2.07	2.41	2.76
3.....	1.55	1.66	1.76	1.86	1.97	2.07	2.59	3.10	3.62	4.14
4.....	2.07	2.21	2.34	2.48	2.62	2.76	3.45	4.14	4.83	5.52
5.....	2.59	2.76	2.93	3.10	3.28	3.45	4.31	5.17	6.03	6.90
6.....	3.10	3.31	3.52	3.72	3.93	4.14	5.17	6.21	7.24	8.28
7.....	3.62	3.86	4.10	4.34	4.59	4.83	6.03	7.24	8.45	9.66
8.....	4.14	4.41	4.69	4.97	5.24	5.52	6.90	8.28	9.66	11.03
9.....	4.66	4.97	5.28	5.59	5.90	6.21	7.76	9.31	10.86	12.41
10.....	5.17	5.52	5.86	6.21	6.55	6.90	8.62	10.34	12.07	13.79
11.....	5.69	6.07	6.45	6.83	7.21	7.59	9.48	11.38	13.28	15.17
12.....	6.21	6.62	7.04	7.45	7.86	8.28	10.34	12.41	14.48	16.55
13.....	6.72	7.17	7.62	8.07	8.52	8.97	11.21	13.45	15.69	17.93
14.....	7.24	7.72	8.21	8.69	9.17	9.66	12.07	14.48	16.90	19.31
15.....	7.76	8.28	8.79	9.31	9.83	10.34	12.93	15.52	18.10	20.69
16.....	8.28	8.83	9.38	9.93	10.48	11.03	13.79	16.55	19.31	22.07
17.....	8.79	9.38	9.97	10.55	11.14	11.72	14.66	17.59	20.52	23.45
18.....	9.31	9.93	10.55	11.17	11.79	12.41	15.52	18.62	21.72	24.83
19.....	9.83	10.48	11.14	11.79	12.45	13.10	16.38	19.66	22.93	26.21
20.....	10.34	11.03	11.72	12.41	13.10	13.79	17.24	20.69	24.14	27.59
21.....	10.86	11.59	12.31	13.03	13.76	14.48	18.10	21.72	25.34	28.97
22.....	11.38	12.14	12.90	13.65	14.41	15.17	18.97	22.76	26.55	30.34
23.....	11.90	12.69	13.48	14.27	15.07	15.86	19.83	23.79	27.76	31.72
24.....	12.41	13.24	14.07	14.90	15.72	16.55	20.69	24.83	28.97	33.10
25.....	12.93	13.79	14.65	15.52	16.38	17.24	21.55	25.86	30.17	34.48
26.....	13.45	14.34	15.24	16.14	17.03	17.93	22.41	26.90	31.38	35.86
27.....	13.96	14.90	15.83	16.76	17.69	18.62	23.28	27.93	32.59	37.24
28.....	14.48	15.45	16.41	17.38	18.34	19.31	24.14	28.97	33.79	38.62
29.....	15.00	16.00	17.00	18.00	19.00	20.00	25.00	30.00	35.00	40.00

Table for payments by the month, or fractions thereof—Continued.

[Month of 29 days. Rates from $45 to $150.]

	$45	$50	$60	$65	$75	$100	$125	$150
Days.								
1.....	1.55	1.72	2.07	2.24	2.59	3.45	4.31	5.17
2.....	3.10	3.45	4.14	4.48	5.17	6.90	8.62	10.34
3.....	4.66	5.17	6.21	6.72	7.76	10.34	12.93	15.52
4.....	6.21	6.90	8.28	8.97	10.34	13.79	17.24	20.69
5.....	7.76	8.62	10.34	11.21	12.93	17.24	21.55	25.86
6.....	9.31	10.34	12.41	13.45	15.52	20.69	25.86	31.03
7.....	10.86	12.07	14.48	15.69	18.10	24.14	30.17	36.21
8.....	12.41	13.79	16.55	17.93	20.69	27.59	34.48	41.38
9.....	13.97	15.52	18.62	20.17	23.28	31.03	38.79	46.55
10.....	15.52	17.24	20.69	22.41	25.86	34.48	43.10	51.72
11.....	17.07	18.97	22.76	24.66	28.45	37.93	47.41	56.90
12.....	18.62	20.69	24.83	26.90	31.03	41.38	51.72	62.07
13.....	20.17	22.41	26.90	29.14	33.62	44.83	56.03	67.24
14.....	21.72	24.14	28.97	31.38	36.21	48.28	60.34	72.41
15.....	23.28	25.86	31.03	33.62	38.79	51.72	64.66	77.59
16.....	24.83	27.59	33.10	35.86	41.38	55.17	68.97	82.76
17.....	26.38	29.31	35.17	38.10	43.97	58.62	73.28	87.93
18.....	27.93	31.03	37.24	40.34	46.55	62.07	77.59	93.10
19.....	29.48	32.76	39.31	42.59	49.14	65.52	81.90	98.28
20.....	31.03	34.48	41.38	44.83	51.72	68.97	86.21	103.45
21.....	32.59	36.21	43.45	47.07	54.31	72.41	90.52	108.62
22.....	34.14	37.93	45.52	49.31	56.90	75.86	94.83	113.79
23.....	35.69	39.66	47.59	51.55	59.48	79.31	99.14	118.97
24.....	37.24	41.38	49.66	53.79	62.07	82.76	103.45	124.14
25.....	38.79	43.10	51.72	56.03	64.66	86.21	107.76	129.31
26.....	40.34	44.83	53.79	58.28	67.24	89.66	112.07	134.48
27.....	41.90	46.55	55.86	60.52	69.83	93.10	116.38	139.66
28.....	43.45	48.28	57.93	62.76	72.41	96.55	120.69	144.83
29.....	45.00	50.00	60.00	65.00	75.00	100.00	125.00	150.00

Table for payments by the month, or fractions thereof—Continued.

[Month of 28 days. Rates from $15 to $40.]

	$15	$16	$17	$18	$19	$20	$25	$30	$35	$40
Days.										
1.....	.54	.57	.61	.64	.68	.71	.89	1.07	1.25	1.43
2.....	1.07	1.14	1.21	1.29	1.36	1.43	1.79	2.14	2.50	2.86
3.....	1.61	1.71	1.82	1.93	2.04	2.14	2.68	3.21	3.75	4.29
4.....	2.14	2.29	2.43	2.57	2.71	2.86	3.57	4.29	5.00	5.71
5.....	2.68	2.86	3.04	3.21	3.39	3.57	4.46	5.36	6.25	7.14
6.....	3.21	3.43	3.64	3.86	4.07	4.29	5.36	6.43	7.50	8.57
7.....	3.75	4.00	4.25	4.50	4.75	5.00	6.25	7.50	8.75	10.00
8.....	4.29	4.57	4.86	5.14	5.43	5.71	7.14	8.57	10.00	11.43
9.....	4.82	5.14	5.46	5.79	6.11	6.43	8.03	9.64	11.25	12.86
10.....	5.36	5.71	6.07	6.43	6.79	7.14	8.93	10.71	12.50	14.29
11.....	5.89	6.29	6.68	7.07	7.46	7.86	9.82	11.79	13.75	15.71
12.....	6.43	6.86	7.29	7.71	8.14	8.57	10.71	12.86	15.00	17.14
13.....	6.96	7.43	7.89	8.36	8.82	9.29	11.61	13.93	16.25	18.57
14.....	7.50	8.00	8.50	9.00	9.50	10.00	12.50	15.00	17.50	20.00
15.....	8.04	8.57	9.11	9.64	10.18	10.71	13.39	16.07	18.75	21.43
16.....	8.57	9.14	9.71	10.28	10.86	11.43	14.29	17.14	20.00	22.86
17.....	9.11	9.71	10.32	10.93	11.53	12.14	15.18	18.21	21.25	24.29
18.....	9.64	10.28	10.93	11.57	12.21	12.86	16.07	19.29	22.50	25.71
19.....	10.18	10.86	11.53	12.21	12.89	13.57	16.97	20.36	23.75	27.14
20.....	10.71	11.43	12.14	12.86	13.57	14.28	17.86	21.43	25.00	28.57
21.....	11.25	12.00	12.75	13.50	14.25	15.00	18.75	22.50	26.25	30.00
22.....	11.78	12.57	13.36	14.14	14.93	15.71	19.64	23.57	27.50	31.43
23.....	12.32	13.14	13.96	14.78	15.61	16.43	20.54	24.64	28.75	32.86
24.....	12.86	13.71	14.57	15.43	16.28	17.14	21.43	25.71	30.00	34.29
25.....	13.39	14.28	15.18	16.07	16.96	17.86	22.32	26.79	31.25	35.71
26.....	13.93	14.86	15.78	16.71	17.64	18.57	23.21	27.86	32.50	37.14
27.....	14.46	15.43	16.39	17.36	18.32	19.28	24.11	28.93	33.75	38.57
28.....	15.00	16.00	17.00	18.00	19.00	20.00	25.00	30.00	35.00	40.00

Table for payments by the month, or fractions thereof—Continued.

[Month of 28 days. Rates from $45 to $150.]

	$45	$50	$60	$65	$75	$100	$125	$150
Days.								
1.....	1.61	1.79	2.14	2.32	2.68	3.57	4.46	5.36
2.....	3.21	3.57	4.29	4.64	5.36	7.14	8.93	10.71
3.....	4.82	5.36	6.43	6.96	8.04	10.71	13.39	16.07
4.....	6.43	7.14	8.57	9.29	10.71	14.29	17.86	21.43
5.....	8.04	8.93	10.71	11.61	13.39	17.86	22.32	26.79
6.....	9.64	10.71	12.86	13.93	16.07	21.43	26.79	32.14
7.....	11.25	12.50	15.00	16.25	18.75	25.00	31.25	37.50
8.....	12.86	14.29	17.14	18.57	21.43	28.57	35.71	42.86
9.....	14.46	16.07	19.29	20.89	24.11	32.14	40.18	48.21
10.....	16.07	17.86	21.43	23.21	26.79	35.71	44.64	53.57
11.....	17.68	19.64	23.57	25.54	29.46	39.29	49.11	58.93
12.....	19.29	21.43	25.71	27.86	32.14	42.86	53.57	64.29
13.....	20.89	23.21	27.86	30.18	34.82	46.43	58.04	69.64
14.....	22.50	25.00	30.00	32.50	37.50	50.00	62.50	75.00
15.....	24.11	26.79	32.14	34.82	40.18	53.57	66.96	80.36
16.....	25.71	28.57	34.29	37.14	52.86	57.14	71.43	85.71
17.....	27.32	30.36	36.43	39.46	45.54	60.71	75.89	91.07
18.....	28.93	32.14	38.57	41.79	48.21	64.29	80.36	96.43
19.....	30.54	33.93	40.71	44.11	50.89	67.86	84.82	101.79
20.....	32.14	35.71	42.86	46.43	53.57	71.43	89.29	107.14
21.....	33.75	37.50	45.00	48.75	56.25	75.00	93.75	112.50
22.....	35.36	39.29	47.14	51.07	58.93	78.57	98.21	117.86
23.....	36.96	41.07	49.29	53.39	61.61	82.14	102.68	123.21
24.....	38.57	42.86	51.43	55.71	64.29	85.71	107.14	128.57
25.....	40.18	44.64	53.57	58.04	66.96	89.29	111.61	133.93
26.....	41.79	46.43	55.71	60.36	69.64	92.86	116.07	139.29
27.....	43.39	48.21	57.86	62.68	72.32	96.43	120.54	144.64
28.....	45.00	50.00	60.00	65.00	75.00	100.00	125.00	150.00

Table for payments by the month, or fractions thereof—Continued.

[Month of 30 days. Rates from $15 to $40.]

	$15	$16	$17	$18	$19	$20	$25	$30	$35	$40
Days.										
1.....	.50	.53	.57	.60	.63	.67	.83	1.00	1.17	1.33
2.....	1.00	1.07	1.13	1.20	1.27	1.33	1.67	2.00	2.33	2.67
3.....	1.50	1.60	1.70	1.80	1.90	2.00	2.50	3.00	3.50	4.00
4.....	2.00	2.13	2.27	2.40	2.53	2.67	3.33	4.00	4.67	5.33
5.....	2.50	2.67	2.83	3.00	3.17	3.33	4.17	5.00	5.83	6.67
6.....	3.00	3.20	3.40	3.60	3.80	4.00	5.00	6.00	7.00	8.00
7.....	3.50	3.73	3.97	4.20	4.43	4.67	5.83	7.00	8.17	9.33
8.....	4.00	4.27	4.53	4.80	5.07	5.33	6.67	8.00	9.33	10.67
9.....	4.50	4.80	5.10	5.40	5.70	6.00	7.50	9.00	10.50	12.00
10.....	5.00	5.33	5.67	6.00	6.33	6.67	8.33	10.00	11.67	13.33
11.....	5.50	5.87	6.23	6.60	6.97	7.33	9.17	11.00	12.83	14.67
12.....	6.00	6.40	6.80	7.20	7.60	8.00	10.00	12.00	14.00	16.00
13.....	6.50	6.93	7.37	7.80	8.23	8.67	10.83	13.00	15.17	17.33
14.....	7.00	7.47	7.93	8.40	8.87	9.33	11.67	14.00	16.33	18.67
15.....	7.50	8.00	8.50	9.00	9.50	10.00	12.50	15.00	17.50	20.00
16.....	8.00	8.53	9.07	9.60	10.13	10.67	13.33	16.00	18.67	21.33
17.....	8.50	9.07	9.63	10.20	10.77	11.33	14.17	17.00	19.83	22.67
18.....	9.00	9.60	10.20	10.80	11.40	12.00	15.00	18.00	21.00	24.00
19.....	9.50	10.13	10.77	11.40	12.03	12.67	15.83	19.00	22.17	25.33
20.....	10.00	10.67	11.33	12.00	12.67	13.33	16.67	20.00	23.33	26.67
21.....	10.50	11.20	11.90	12.60	13.30	14.00	17.50	21.00	24.50	28.00
22.....	11.00	11.73	12.47	13.20	13.93	14.67	18.33	22.00	25.67	29.33
23.....	11.50	12.27	13.03	13.80	14.57	15.33	19.17	23.00	26.83	30.67
24.....	12.00	12.80	13.60	14.40	15.20	16.00	20.00	24.00	28.00	32.00
25.....	12.50	13.33	14.17	15.00	15.83	16.67	20.83	25.00	29.17	33.33
26.....	13.00	13.87	14.73	15.60	16.47	17.33	21.67	26.00	30.33	34.67
27.....	13.50	14.40	15.30	16.20	17.10	18.00	22.50	27.00	31.50	36.00
28.....	14.00	14.93	15.87	16.80	17.73	18.67	23.33	28.00	32.67	37.33
29.....	14.50	15.47	16.43	17.40	18.37	19.33	24.17	29.00	33.83	38.67
30.....	15.00	16.00	17.00	18.00	19.00	20.00	25.00	30.00	35.00	40.00

Table for payments by the month, or fractions thereof—Continued.

[Month of 30 days. Rates from $45 to $150.]

	$45	$50	$60	$65	$75	$100	$125	$150
Days.								
1.....	1.50	1.67	2.00	2.17	2.50	3.33	4.17	5.00
2.....	3.00	3.33	4.00	4.33	5.00	6.67	8.33	10.00
3.....	4.50	5.00	6.00	6.50	7.50	10.00	12.50	15.00
4.....	6.00	6.67	8.00	8.67	10.00	13.33	16.67	20.00
5.....	7.50	8.33	10.00	10.83	12.50	16.67	20.83	25.00
6.....	9.00	10.00	12.00	13.00	15.00	20.00	25.00	30.00
7.....	10.50	11.67	14.00	15.17	17.50	23.33	29.17	35.00
8.....	12.00	13.33	16.00	17.33	20.00	26.67	33.33	40.00
9.....	13.50	15.00	18.00	19.50	22.50	30.00	27.50	45.00
10.....	15.00	16.67	20.00	21.67	25.00	33.33	41.67	50.00
11.....	16.50	18.33	22.00	23.83	27.50	36.67	45.83	55.00
12.....	18.00	20.00	24.00	26.00	30.00	40.00	50.00	60.00
13.....	19.50	21.67	26.00	28.17	32.50	43.33	54.17	65.00
14.....	21.00	23.33	28.00	30.33	35.00	46.67	58.33	70.00
15.....	22.50	25.00	30.00	32.50	37.50	50.00	62.50	75.00
16.....	24.00	26.67	32.00	34.67	40.00	53.33	66.67	80.00
17.....	25.50	28.33	34.00	36.83	42.50	56.67	70.83	85.00
18.....	27.00	30.00	36.00	39.00	45.00	60.00	75.00	90.00
19.....	28.50	31.67	38.00	41.17	47.50	63.33	79.17	95.00
20.....	30.00	33.33	40.00	43.33	50.00	66.67	83.33	100.00
21.....	31.50	35.00	42.00	45.50	52.50	70.00	87.50	105.00
22.....	33.00	36.67	44.00	47.67	55.00	73.33	91.67	110.00
23.....	34.50	38.33	46.00	49.83	57.50	76.67	95.83	115.00
24.....	36.00	40.00	48.00	52.00	60.00	80.00	100.00	120.00
25.....	37.50	41.67	50.00	54.17	62.50	83.33	104.17	125.00
26.....	39.00	43.33	52.00	56.33	65.00	86.67	108.33	130.00
27.....	40.50	45.00	54.00	58.50	67.50	90.00	112.50	135.00
28.....	42.00	46.67	56.00	60.67	70.00	93.33	116.67	140.00
29.....	43.50	48.33	58.00	62.83	72.50	96.67	120.83	145.00
30.....	45.00	50.00	60.00	65.00	75.00	100.00	125.00	150.00

Table for payments by the month, or fractions thereof—Continued.

[Month of 31 days. Rates from $15 to $40.]

	$15	$16	$17	$18	$19	$20	$25	$30	$35	$40
Days.										
1.....	.48	.52	.55	.58	.61	.65	.81	.97	1.13	1.29
2.....	.97	1.03	1.10	1.16	1.23	1.29	1.61	1.94	2.26	2.58
3.....	1.45	1.55	1.65	1.74	1.84	1.94	2.42	2.90	3.39	3.87
4.....	1.94	2.06	2.19	2.32	2.45	2.58	3.23	3.87	4.52	5.16
5.....	2.42	2.58	2.74	2.90	3.06	3.23	4.03	4.84	5.65	6.45
6.....	2.90	3.10	3.29	3.48	3.68	3.87	4.84	5.81	6.77	7.74
7.....	3.39	3.61	3.84	4.06	4.29	4.52	5.64	6.77	7.90	9.03
8.....	3.87	4.13	4.39	4.65	4.90	5.16	6.45	7.74	9.03	10.32
9.....	4.35	4.65	4.94	5.23	5.52	5.81	7.26	8.71	10.16	11.61
10.....	4.84	5.16	5.48	5.81	6.13	6.45	8.06	9.68	11.29	12.90
11.....	5.32	5.68	6.03	6.39	6.74	7.10	8.87	10.65	12.42	14.19
12.....	5.81	6.19	6.58	6.97	7.35	7.74	9.68	11.61	13.55	15.48
13.....	6.29	6.71	7.13	7.55	7.97	8.39	10.48	12.58	14.68	16.77
14.....	6.77	7.23	7.68	8.13	8.58	9.03	11.29	13.55	15.81	18.06
15.....	7.26	7.74	8.23	8.71	9.19	9.68	12.10	14.52	16.94	19.35
16.....	7.74	8.26	8.77	9.29	9.81	10.32	12.90	15.48	18.06	20.65
17.....	8.23	8.77	9.32	9.87	10.42	10.97	13.71	16.45	19.19	21.94
18.....	8.71	9.29	9.87	10.45	11.03	11.61	14.52	17.42	20.32	23.23
19.....	9.19	9.81	10.42	11.03	11.64	12.26	15.32	18.39	21.45	24.52
20.....	9.68	10.32	10.97	11.61	12.26	12.90	16.13	19.35	22.58	25.81
21.....	10.16	10.84	11.52	12.19	12.87	13.55	16.94	20.32	23.71	27.10
22.....	10.64	11.35	12.06	12.77	13.48	14.19	17.74	21.29	24.84	28.39
23.....	11.13	11.87	12.61	13.35	14.10	14.84	18.55	22.26	25.97	29.68
24.....	11.61	12.39	13.16	13.93	14.71	15.48	19.35	23.23	27.10	30.97
25.....	12.10	12.90	13.71	14.52	15.32	16.13	20.16	24.19	28.13	32.26
26.....	12.58	13.42	14.26	15.10	15.93	16.77	20.97	25.16	29.35	33.55
27.....	13.06	13.93	14.81	15.68	16.55	17.42	21.77	26.13	30.48	34.84
28.....	13.55	14.45	15.35	16.26	17.16	18.06	22.58	27.10	31.61	36.13
29.....	14.03	14.97	15.90	16.84	17.77	18.71	23.39	28.06	32.74	37.42
30.....	14.52	15.48	16.45	17.42	18.39	19.35	24.19	29.03	33.87	38.71
31.....	15.00	16.00	17.00	18.00	19.00	20.00	25.00	30.00	35.00	40.00

Table for payments by the month, or fractions thereof—Continued.

[Month of 31 days. Rates from $45 to $150.]

	$45	$50	$60	$65	$75	$100	$125	$150
Days.								
1.....	1.45	1.61	1.94	2.10	2.42	3.23	4.03	4.84
2.....	2.90	3.23	3.87	4.19	4.84	6.45	8.06	9.68
3.....	4.35	4.84	5.81	6.29	7.26	9.68	12.10	14.52
4.....	5.81	6.45	7.74	8.39	9.68	12.90	16.13	19.35
5.....	7.26	8.06	9.68	10.48	12.10	16.13	20.16	24.19
6.....	8.71	9.68	11.61	12.58	14.52	19.35	24.19	29.03
7.....	10.16	11.29	13.55	14.68	16.94	22.58	28.23	33.87
8.....	11.61	12.90	15.48	16.77	19.35	25.81	32.26	38.71
9.....	13.06	14.52	17.42	18.87	21.77	29.03	36.29	43.55
10.....	14.52	16.13	19.35	20.97	24.19	32.26	40.32	48.39
11.....	15.97	17.74	21.29	23.06	26.61	35.48	44.35	53.23
12.....	17.42	19.35	23.23	25.16	29.03	38.71	48.39	58.06
13.....	18.87	20.97	25.16	27.26	31.45	41.94	52.42	62.90
14.....	20.32	22.58	27.10	29.35	33.87	45.16	56.45	67.74
15.....	21.77	24.19	29.03	31.45	36.29	48.39	60.48	72.58
16.....	23.23	25.81	30.97	33.55	38.71	51.61	64.52	77.42
17.....	24.68	27.42	32.90	35.65	41.13	54.84	68.55	82.26
18.....	26.13	29.03	34.84	37.74	43.55	58.06	72.58	87.10
19.....	27.58	30.65	36.77	39.84	45.97	61.29	76.61	91.94
20.....	29.03	82.26	38.71	41.94	48.39	64.52	80.65	96.77
21.....	30.48	33.87	40.65	44.03	50.81	67.74	84.68	101.61
22.....	31.94	35.48	42.58	46.13	53.23	70.97	88.71	106.45
23.....	33.39	37.10	44.52	48.23	55.65	74.19	92.74	111.29
24.....	34.84	38.71	46.45	50.32	58.06	77.42	96.77	116.13
25.....	36.29	40.32	48.39	52.42	60.48	80.65	100.81	120.97
26.....	37.74	41.94	50.32	54.52	62.90	83.87	104.84	125.81
27.....	39.19	43.55	52.26	56.61	65.32	87.10	108.87	130.65
28.....	40.65	45.16	54.19	58.71	67.74	90.32	112.90	135.48
29.....	42.10	46.77	56.13	60.81	70.16	93.55	116.94	140.32
30.....	43.55	48.39	58.06	62.90	72.58	96.77	120.97	145.16
31.....	45.00	50.00	60.00	65.00	75.00	100.00	125.00	150.00

53. Annual Salary Tables.

Table for payment of annual or quarterly salaries.

$4,000 PER ANNUM.

$1,000 per quarter.		First quarter, 90 days.		Second quarter, 91 days.		Third and fourth quarters, 92 days.	
This column is only to be used in making monthly or quarterly payments.		*Days.*		*Days.*		*Days.*	
		1	$11.11	1	$10.99	1	$10.87
		2	22.22	2	21.98	2	21.74
FIRST QUARTER.		3	33.33	3	32.97	3	32.61
January,	31 days... $344.40	4	44.44	4	43.96	4	43.48
February,	28 days... 311.20	5	55.56	5	54.95	5	54.35
March,	31 days... 344.40	6	66.67	6	65.93	6	65.22
	1,000.00	7	77.78	7	76.92	7	26.09
SECOND QUARTER.		8	88.89	8	87.91	8	86.96
April,	30 days... $329.70	9	100.00	9	98.90	9	97.83
May,	31 days... 340.60	10	111.11	10	109.89	10	108.70
June,	30 days... 329.70	11	122.22	11	120.88	11	119.57
	1,000.00	12	133.33	12	131.87	12	130.43
THIRD QUARTER.		13	144.44	13	142.86	13	141.30
July,	31 days... $337.00	14	155.56	14	153.85	14	152.17
August,	31 days... 337.00	15	166.67	15	164.84	15	163.04
September,	30 days... 326.00	16	177.78	16	175.82	16	173.91
	1,000.00	17	188.89	17	186.81	17	184.78
FOURTH QUARTER.		18	200.00	18	197.80	18	195.65
October,	31 days... $337.00	19	211.11	19	208.79	19	206.52
November,	30 days... 326.00	20	222.22	20	219.78	20	217.39
December,	31 days... 337.00	21	233.33	21	230.77	21	228.26
	1,000.00	22	244.44	22	241.76	22	239.13
LEAP YEAR—FIRST QUARTER.		23	255.56	23	252.75	23	250.00
January,	31 days... $340.70	24	266.67	24	263.74	24	260.87
February,	29 days... 318.60	25	277.78	25	274.73	25	271.74
March,	31 days... 340.70	26	288.89	26	285.71	26	282.61
	1,000.00	27	300.00	27	296.70	27	293.48
		28	311.11	28	307.69	28	304.35
		29	322.22	29	318.68	29	315.22
		30	333.33	30	329.67	30	326.09
		31	344.44	31	340.66	31	336.96

NOTE.—For fractional parts of any month in the first quarter of leap year, use the column under second quarter, the rate of pay being the same.

Table for payment of annual or quarterly salaries—Continued.

$3,600 PER ANNUM.

$900 per quarter.			First quarter, 90 days.		Second quarter, 91 days.		Third and fourth quarters, 92 days.	
This column is only to be used in making monthly or quarterly payments.			*Days.*		*Days.*		*Days.*	
			1	$10.00	1	$9.89	1	$9.78
			2	20.00	2	19.78	2	19.57
FIRST QUARTER.			3	30.00	3	29.67	3	29.35
January,	31 days...	$310.00	4	40.00	4	39.56	4	39.13
February,	28 days...	280.00	5	50.00	5	49.45	5	48.91
March,	31 days...	310.00	6	60.00	6	59.34	6	58.70
		900.00	7	70.00	7	69.23	7	68.48
			8	80.00	8	79.12	8	78.26
SECOND QUARTER.			9	90.00	9	89.01	9	88.04
April,	30 days...	$296.70	10	100.00	10	98.90	10	97.83
May,	31 days...	306.60	11	110.00	11	108.79	11	107.61
June,	30 days...	296.70	12	120.00	12	118.68	12	117.39
		900.00	13	130.00	13	128.57	13	127.17
			14	140.00	14	138.46	14	136.96
THIRD QUARTER.			15	150.00	15	148.35	15	146.74
July,	31 days...	$303.30	16	160.00	16	158.24	16	156.52
August,	31 days...	303.30	17	170.00	17	168.13	17	166.30
September,	30 days...	293.40	18	180.00	18	178.02	18	176.09
		900.00	19	190.00	19	187.91	19	185.87
			20	200.00	20	197.80	20	195.65
FOURTH QUARTER.			21	210.00	21	207.69	21	205.43
October,	31 days...	$303.30	22	220.00	22	217.58	22	215.22
November,	30 days...	293.40	23	230.00	23	227.47	23	225.00
December,	31 days...	303.30	24	240.00	24	237.36	24	234.78
		900.00	25	250.00	25	247.25	25	244.57
LEAP YEAR—FIRST QUARTER.			26	260.00	26	257.14	26	254.35
			27	270.00	27	267.03	27	264.13
January,	31 days...	$306.60	28	280.00	28	276.92	28	273.91
February,	29 days...	286.80	29	290.00	29	286.81	29	283.70
March,	31 days...	306.60	30	300.00	30	296.70	30	293.48
		900.00	31	310.00	31	306.59	31	303.26

NOTE.—For fractional parts of any month in the first quarter of leap year, use the column under second quarter, the rate of pay being the same.

Table for payment of annual or quarterly salaries—Continued.

$3,500 PER ANNUM.

$875 per quarter.			First quarter, 90 days.		Second quarter, 91 days.		Third and fourth quarters, 92 days.	
This column is to be used only in making monthly or quarterly payments.			*Days.*		*Days.*		*Days.*	
			1	$9.72	1	$9.62	1	$9.51
			2	19.44	2	19.23	2	19.02
FIRST QUARTER.			3	29.17	3	28.85	3	28.53
January,	31 days...	$301.40	4	38.89	4	38.46	4	38.04
February,	28 days...	272.20	5	48.61	5	48.08	5	47.55
March,	31 days...	301.40	6	58.33	6	57.69	6	57.07
		875.00	7	68.06	7	67.31	7	66.58
			8	77.78	8	76.92	8	76.09
SECOND QUARTER.			9	87.50	9	86.54	9	85.60
April,	30 days...	$288.50	10	97.22	10	96.15	10	95.11
May,	31 days...	298.00	11	106.94	11	105.77	11	104.62
June,	30 days...	288.50	12	116.67	12	115.38	12	114.13
		875.00	13	126.39	13	125.00	13	123.64
			14	136.11	14	134.62	14	133.15
THIRD QUARTER.			15	145.83	15	144.23	15	142.66
July,	31 days...	$294.80	16	155.56	16	153.85	16	152.17
August,	31 days...	294.80	17	165.28	17	163.46	17	161.68
September,	30 days...	285.40	18	175.00	18	173.08	18	171.20
		875.00	19	184.72	19	182.69	19	180.71
			20	194.44	20	192.31	20	190.22
FOURTH QUARTER.			21	204.17	21	201.92	21	199.73
October,	31 days...	$294.80	22	213.89	22	211.54	22	209.24
November,	30 days...	285.40	23	223.61	23	221.15	23	218.75
December,	31 days...	294.80	24	233.33	24	230.77	24	228.26
		875.00	25	243.06	25	240.38	25	237.77
LEAP YEAR—FIRST QUARTER.			26	252.78	26	250.00	26	247.28
			27	262.50	27	259.62	27	256.79
January,	31 days...	$298.10	28	272.22	28	269.23	28	266.30
February,	29 days...	278.80	29	281.94	29	278.85	29	275.81
March,	31 days...	298.10	30	291.67	30	288.46	30	285.33
		875.00	31	301.39	31	298.08	31	294.84

NOTE.—For fractional parts of any month in the first quarter of leap year, use the column under second quarter, the rate of pay being the same.

Table for payment of annual or quarterly salaries—Continued.

$3,000 PER ANNUM.

$750 per quarter.			First quarter, 90 days.		Second quarter, 91 days.		Third and fourth quarters, 92 days.	
This column is only to be used in making monthly or quarterly payments.			*Days.*		*Days.*		*Days.*	
			1	$8.33	1	$8.24	1	$8.15
FIRST QUARTER.			2	16.67	2	16.48	2	16.30
			3	25.00	3	24.73	3	24.46
January,	31 days...	$258.30	4	33.33	4	32.97	4	32.61
February,	28 days...	233.40	5	41.67	5	41.21	5	40.76
March,	31 days...	258.30	6	50.00	6	49.45	6	48.91
		750.00	7	58.33	7	57.69	7	57.07
			8	66.67	8	65.93	8	65.22
SECOND QUARTER.			9	75.00	9	74.18	9	73.37
April,	30 days...	$247.25	10	83.33	10	82.42	10	81.52
May,	31 days...	255.50	11	91.67	11	90.66	11	89.67
June,	30 days...	247.25	12	100.00	12	98.90	12	97.83
		750.00	13	108.33	13	107.14	13	105.98
			14	116.67	14	115.38	14	114.13
THIRD QUARTER.			15	125.00	15	123.63	15	122.28
July,	31 days...	$252.70	16	133.33	16	131.87	16	130.43
August,	31 days...	252.70	17	141.67	17	140.11	17	138.59
September,	30 days...	244.60	18	150.00	18	148.35	18	146.74
		750.00	19	158.33	19	156.59	19	154.89
			20	166.67	20	164.84	20	163.04
FOURTH QUARTER.			21	175.00	21	173.08	21	171.20
October,	31 days...	$252.70	22	183.33	22	181.32	22	179.35
November,	30 days...	244.60	23	191.67	23	189.56	23	187.50
December,	31 days...	252.70	24	200.00	24	197.80	24	195.65
		750.00	25	208.33	25	206.04	25	203.80
LEAP YEAR—FIRST QUARTER.			26	216.67	26	214.29	26	211.96
			27	225.00	27	222.53	27	220.11
January,	31 days...	$255.50	28	233.33	28	230.77	28	228.26
February,	29 days...	239.00	29	241.67	29	239.01	29	236.41
March,	31 days...	255.50	30	250.00	30	247.25	30	244.57
		750.00	31	258.33	31	255.49	31	252.72

NOTE.—For fractional parts of any month in the first quarter of leap year, use the column under second quarter, the rate of pay being the same.

Table for payment of annual or quarterly salaries—Continued.

$2,800 PER ANNUM.

$700 per quarter.			First quarter, 90 days.		Second quarter, 91 days.		Third and fourth quarters, 92 days.	
This column is to be used only in making monthly or quarterly payments.			*Days.*		*Days.*		*Days.*	
			1	$7.78	1	$7.69	1	$7.61
			2	15.56	2	15.38	2	15.22
FIRST QUARTER.			3	23.33	3	23.08	3	22.83
January,	31 days...	$241.10	4	31.11	4	30.77	4	30.43
February,	28 days...	217.80	5	38.89	5	38.46	5	38.04
March,	31 days...	241.10	6	46.67	6	46.15	6	45.65
		700.00	7	54.44	7	53.85	7	53.26
			8	62.22	8	61.54	8	60.87
SECOND QUARTER.			9	70.00	9	69.23	9	68.48
April,	30 days...	$230.80	10	77.78	10	76.92	10	76.09
May,	31 days...	238.40	11	85.56	11	84.62	11	83.70
June,	30 days...	230.80	12	93.33	12	92.31	12	91.30
		700.00	13	101.11	13	100.00	13	98.91
			14	108.89	14	107.69	14	106.52
THIRD QUARTER.			15	116.67	15	115.38	15	114.13
July,	31 days...	$235.90	16	124.44	16	123.08	16	121.74
August,	31 days...	235.90	17	132.22	17	130.77	17	129.35
September,	30 days...	228.20	18	140.00	18	138.46	18	136.96
		700.00	19	147.78	19	146.15	19	144.57
			20	155.56	20	153.85	20	152.17
FOURTH QUARTER.			21	163.33	21	161.54	21	159.78
October,	31 days...	$235.90	22	171.11	22	169.23	22	167.39
November,	30 days...	228.20	23	178.89	23	176.92	23	175.00
December,	31 days...	235.90	24	186.67	24	184.62	24	182.61
		700.00	25	194.44	25	192.31	25	190.22
			26	202.22	26	200.00	26	197.83
LEAP YEAR—FIRST QUARTER.			27	210.00	27	207.69	27	205.43
January,	31 days...	$238.50	28	217.78	28	215.38	28	213.04
February,	29 days...	223.00	29	225.56	29	223.08	29	220.65
March,	31 days...	238.50	30	233.33	30	230.77	30	228.26
		700.00	31	241.11	31	238.46	31	235.87

NOTE.—For fractional parts of any month in the first quarter of leap year, use the column under second quarter, the rate of pay being the same.

Table for payment of annual or quarterly salaries—Continued.

$2,700 PER ANNUM.

$675 per quarter.			First quarter, 90 days.		Second quarter, 91 days.		Third and fourth quarters, 92 days.	
This column is only to be used in making monthly or quarterly payments.			*Days.*		*Days.*		*Days.*	
			1	$7.50	1	$7.42	1	$7.34
			2	15.00	2	14.84	2	14.67
FIRST QUARTER.			3	22.50	3	22.25	3	22.01
January,	31 days...	$232.50	4	30.00	4	29.67	4	29.35
February,	28 days...	210.00	5	37.50	5	37.09	5	36.68
March,	31 days...	232.50	6	45.00	6	44.51	6	44.02
		675.00	7	52.50	7	51.92	7	51.36
SECOND QUARTER.			8	60.00	8	59.34	8	58.70
			9	67.50	9	66.76	9	66.03
April,	30 days...	$222.50	10	75.00	10	74.18	10	73.37
May,	31 days...	230.00	11	82.50	11	81.59	11	80.71
June,	30 days...	222.50	12	90.00	12	89.01	12	88.04
		675.00	13	97.50	13	96.43	13	95.38
THIRD QUARTER.			14	105.00	14	103.85	14	102.72
			15	112.50	15	111.26	15	110.05
July,	31 days...	$227.40	16	120.00	16	118.68	16	117.39
August,	31 days...	227.40	17	127.50	17	126.10	17	124.73
September,	30 days...	220.20	18	135.00	18	133.52	18	132.07
		675.00	19	142.50	19	140.93	19	139.40
FOURTH QUARTER.			20	150.00	20	148.35	20	146.74
			21	157.50	21	155.77	21	154.08
October,	31 days...	$227.40	22	165.00	22	163.19	22	161.41
November,	30 days...	220.20	23	172.50	23	170.60	23	168.75
December,	31 days...	227.40	24	180.00	24	178.02	24	176.09
		675.00	25	187.50	25	185.44	25	183.42
LEAP YEAR—FIRST QUARTER.			26	195.00	26	192.86	26	190.76
			27	202.50	27	200.27	27	198.10
January,	31 days...	$229.90	28	210.00	28	207.69	28	205.43
February,	29 days...	215.20	29	217.50	29	215.11	29	212.77
March,	31 days...	229.90	30	225.00	30	222.53	30	220.11
		675.00	31	232.50	31	229.94	31	227.45

NOTE.—For fractional parts of any month in the first quarter of leap year, use the column under second quarter, the rate of pay being the same.

Table for payment of annual or quarterly salaries—Continued.

$2,500 PER ANNUM.

$625 per quarter.			First quarter, 90 days.		Second quarter, 91 days.		Third and fourth quarters, 92 days.	
This column is only to be used in making monthly or quarterly payments.			*Days.*		*Days.*		*Days.*	
			1	$6.94	1	$6.87	1	$6.79
			2	13.89	2	13.74	2	13.59
FIRST QUARTER.			3	20.83	3	20.60	3	20.38
January,	31 days...	$215.30	4	27.78	4	27.47	4	27.17
February,	28 days...	194.40	5	34.72	5	34.34	5	33.97
March,	31 days...	215.30	6	41.67	6	41.21	6	40.76
		625.00	7	48.61	7	48.08	7	47.55
			8	55.56	8	54.95	8	54.35
SECOND QUARTER.			9	62.50	9	61.81	9	61.14
April,	30 days...	$206.00	10	69.44	10	68.68	10	67.93
May,	31 days...	213.00	11	76.39	11	75.55	11	74.73
June,	30 days...	206.00	12	83.33	12	82.42	12	81.52
		625.00	13	90.28	13	89.29	13	88.32
			14	97.22	14	96.15	14	95.11
THIRD QUARTER.			15	104.17	15	103.02	15	101.90
July,	31 days...	$210.60	16	111.11	16	109.89	16	108.70
August,	31 days...	210.60	17	118.06	17	116.76	17	115.49
September,	30 days...	203.80	18	125.00	18	123.63	18	122.28
		625.00	19	131.94	19	130.49	19	129.08
			20	138.89	20	137.36	20	135.87
FOURTH QUARTER.			21	145.83	21	144.23	21	142.66
October,	31 days...	$210.60	22	152.78	22	151.10	22	149.46
November,	30 days...	203.80	23	159.72	23	157.97	23	156.25
December,	31 days...	210.60	24	166.67	24	164.84	24	163.04
		625.00	25	173.61	25	171.70	25	169.84
			26	180.56	26	178.57	26	176.63
LEAP YEAR—FIRST QUARTER.			27	187.50	27	185.44	27	183.42
January,	31 days...	$212.90	28	194.44	28	192.31	28	190.22
February,	29 days...	199.20	29	201.39	29	199.18	29	197.01
March,	31 days...	212.90	30	208.33	30	206.04	30	203.80
		625.00	31	215.28	31	212.91	31	210.60

NOTE.—For fractional parts of any month in the first quarter of leap year, use the column under second quarter, the rate of pay being the same.

Table for payment of annual or quarterly salaries—Continued.

$2,400 PER ANNUM.

$600 per quarter.			First quarter, 90 days.		Second quarter, 91 days.		Third and fourth quarters, 92 days.	
This column is only to be used in making monthly or quarterly payments.			*Days.*		*Days.*		*Days.*	
			1	$6.67	1	$6.59	1	$6.52
			2	13.33	2	13.19	2	13.04
FIRST QUARTER.			3	20.00	3	19.78	3	19.57
January,	31 days...	$206.70	4	26.67	4	26.37	4	26.09
February,	28 days...	186.60	5	33.33	5	32.97	5	32.61
March,	31 days...	206.70	6	40.00	6	39.56	6	39.13
		600.00	7	46.67	7	46.15	7	45.65
			8	53.33	8	52.75	8	52.17
SECOND QUARTER.			9	60.00	9	59.34	9	58.70
April,	30 days...	$197.80	10	66.67	10	65.93	10	65.22
May,	31 days...	204.40	11	73.33	11	72.53	11	71.74
June,	30 days...	197.80	12	80.00	12	79.12	12	78.26
		600.00	13	86.67	13	85.71	13	84.78
			14	93.33	14	92.31	14	91.03
THIRD QUARTER.			15	100.00	15	98.90	15	97.83
July,	31 days,...	$202.20	16	106.67	16	105.49	16	104.35
August,	31 days...	202.20	17	113.33	17	112.09	17	110.87
September,	30 days...	195.60	18	120.00	18	118.68	18	117.39
		600.00	19	126.67	19	125.27	19	123.91
			20	133.33	20	131.87	20	130.43
FOURTH QUARTER.			21	140.00	21	138.46	21	136.96
October,	31 days...	$202.20	22	146.67	22	145.05	22	143.48
November,	30 days...	195.60	23	153.33	23	151.65	23	150.00
December	31 days...	202.20	24	160.00	24	158.24	24	156.52
		600.00	25	166.67	25	164.84	25	163.04
			26	173.33	26	171.43	26	169.57
LEAP YEAR—FIRST QUARTER.			27	180.00	27	178.02	27	176.09
January,	31 days...	$204.40	28	186.67	28	184.62	28	182.61
February,	29 days...	191.20	29	193.33	29	191.21	29	189.13
March,	31 days...	204.40	30	200.00	30	197.80	30	195.65
		600.00	31	206.67	31	204.40	31	202.17

NOTE.—For fractional parts of any month in the first quarter of leap year, use the column under second quarter, the rate of pay being the same.

Table for payment of annual or quarterly salaries—Continued.

$2,200 PER ANNUM.

$550 per quarter.			First quarter, 90 days.		Second quarter, 91 days.		Third and fourth quarters, 92 days.	
This column is only to be used in making monthly or quarterly payments.			*Days.*		*Days.*		*Days.*	
			1	$6.11	1	$6.04	1	$5.98
			2	12.22	2	12.09	2	11.96
FIRST QUARTER.			3	18.33	3	18.13	3	17.93
January,	31 days...	$189.40	4	24.44	4	24.18	4	23.91
February,	28 days...	171.20	5	30.56	5	30.22	5	29.89
March,	31 days...	189.40	6	36.67	6	36.26	6	35.87
		550.00	7	42.78	7	42.31	7	41.85
			8	48.89	8	48.35	8	47.83
SECOND QUARTER.			9	55.00	9	54.40	9	53.80
April,	30 days...	$181.30	10	61.11	10	60.44	10	59.78
May,	31 days...	187.40	11	67.22	11	66.48	11	65.76
June,	30 days...	181.30	12	73.33	12	72.53	12	71.74
		550.00	13	79.44	13	78.57	13	77.72
			14	85.56	14	84.62	14	83.70
THIRD QUARTER.			15	91.67	15	90.66	15	89.67
July,	31 days...	$185.30	16	97.78	16	96.70	16	95.65
August,	31 days...	185.30	17	103.89	17	102.75	17	101.63
September,	30 days...	179.40	18	110.00	18	108.79	18	107.61
		550.00	19	116.11	19	114.84	19	113.59
			20	122.22	20	120.88	20	119.57
FOURTH QUARTER.			21	128.33	21	126.92	21	125.54
October,	31 days...	$185.30	22	134.44	22	132.97	22	131.52
November,	30 days...	179.40	23	140.56	23	139.04	23	137.50
December,	31 days...	185.30	24	146.67	24	145.05	24	143.48
		550.00	25	152.78	25	151.10	25	149.46
LEAP YEAR—FIRST QUARTER.			26	158.89	26	157.14	26	155.43
			27	165.00	27	163.19	27	161.41
January,	31 days...	$187.40	28	171.11	28	169.23	28	167.39
February,	29 days...	175.20	29	177.22	29	175.27	29	173.37
March,	31 days...	187.40	30	183.33	30	181.32	30	179.35
		550.00	31	189.44	31	187.36	31	185.33

NOTE.—For fractional parts of any month in the first quarter of leap year, use the column under second quarter, the rate of pay being the same.

Table for payment of annual or quarterly salaries—Continued.

$2,000 PER ANNUM.

$500 per quarter.			First quarter, 90 days.		Second quarter, 91 days.		Third and fourth quarters, 92 days.	
This column is only to be used in making monthly or quarterly payments.			*Days.*		*Days.*		*Days.*	
			1	$5.56	1	$5.49	1	$5.43
			2	11.11	2	10.99	2	10.87
FIRST QUARTER.			3	16.67	3	16.48	3	16.30
January,	31 days...	$172.20	4	22.22	4	21.98	4	21.74
February,	28 days...	155.60	5	27.78	5	27.47	5	27.17
March,	31 days...	172.20	6	33.33	6	32.97	6	32.61
		500.00	7	38.89	7	38.46	7	38.04
			8	44.44	8	43.96	8	43.48
SECOND QUARTER.			9	50.00	9	49.45	9	48.91
April,	30 days...	$164.80	10	55.56	10	54.95	10	54.35
May,	31 days...	170.40	11	61.11	11	60.44	11	59.78
June,	30 days...	164.80	12	66.67	12	65.93	12	65.22
		500.00	13	72.22	13	71.43	13	70.65
			14	77.78	14	76.92	14	76.09
THIRD QUARTER.			15	83.33	15	82.42	15	81.52
July,	31 days...	$168.50	16	88.89	16	87.91	16	86.96
August,	31 days...	168.50	17	94.44	17	93.41	17	92.39
September,	30 days...	163.00	18	100.00	18	98.90	18	97.83
		500.00	19	105.56	19	104.40	19	103.26
			20	111.11	20	109.89	20	108.70
FOURTH QUARTER.			21	116.67	21	115.38	21	114.13
October,	31 days...	$168.50	22	122.22	22	120.88	22	119.57
November,	30 days...	163.00	23	127.78	23	126.37	23	125.00
December,	31 days...	168.50	24	133.33	24	131.87	24	130.43
		500.00	25	138.89	25	137.36	25	135.87
LEAP YEAR—FIRST QUARTER.			26	144.44	26	142.86	26	141.30
			27	150.00	27	148.35	27	146.74
January,	31 days...	$170.30	28	155.56	28	153.85	28	152.17
February,	29 days...	159.40	29	161.11	29	159.34	29	157.61
March,	31 days...	170.30	30	166.67	30	164.84	30	163.04
		500.00	31	172.22	31	170.33	31	168.48

NOTE.—For fractional parts of any month in the first quarter of leap year, use the column under second quarter, the rate of pay being the same.

Table for payment of annual or quarterly salaries—Continued.

$1,800 PER ANNUM.

$450 per quarter.		First quarter, 90 days.		Second quarter, 91 days.		Third and fourth quarters, 92 days.	
This column is only to be used in making monthly or quarterly payments.		*Days.*		*Days.*		*Days.*	
		1	$5.00	1	$4.95	1	$4.89
		2	10.00	2	9.89	2	9.78
FIRST QUARTER.		3	15.00	3	14.84	3	14.67
January,	31 days... $155.00	4	20.00	4	19.78	4	19.57
February,	28 days... 140.00	5	25.00	5	24.73	5	24.46
March,	31 days... 155.00	6	30.00	6	29.67	6	29.35
	450.00	7	35.00	7	34.62	7	34.24
		8	40.00	8	39.56	8	39.13
SECOND QUARTER.		9	45.00	9	44.51	9	44.02
April,	30 days... $148.30	10	50.00	10	49.45	10	48.91
May,	31 days... 153.40	11	55.00	11	54.40	11	53.80
June,	30 days... 148.30	12	60.00	12	59.34	12	58.70
	450.00	13	65.00	13	64.29	13	63.59
		14	70.00	14	69.23	14	68.48
THIRD QUARTER.		15	75.00	15	74.18	15	73.37
July,	31 days... $151.60	16	80.00	16	79.12	16	78.26
August,	31 days... 151.60	17	85.00	17	84.07	17	83.15
September,	30 days... 146.80	18	90.00	18	89.01	18	88.04
	450.00	19	95.00	19	93.96	19	92.93
		20	100.00	20	98.90	20	97.83
FOURTH QUARTER.		21	105.00	21	103.85	21	102.72
October,	31 days... $151.60	22	110.00	22	108.79	22	107.61
November,	30 days... 146.80	23	115.00	23	113.74	23	112.50
December,	31 days... 151.60	24	120.00	24	118.68	24	117.39
	450.00	25	125.00	25	123.63	25	122.28
LEAP YEAR—FIRST QUARTER.		26	130.00	26	128.57	26	127.17
January,	31 days... $153.30	27	135.00	27	133.52	27	132.07
February,	29 days... 143.40	28	140.00	28	138.46	28	136.96
March,	31 days... 153.30	29	145.00	29	143.41	29	141.85
	450.00	30	150.00	30	148.35	30	146.74
		31	155.00	31	153.30	31	151.63

NOTE.—For fractional parts of any month in the first quarter of leap year, use the column under second quarter, the rate of pay being the same.

Table for payment of annual or quarterly salaries—Continued.

$1,600 PER ANNUM.

$400 per quarter.			First quarter, 90 days.		Second quarter, 91 days.		Third and fourth quarters, 92 days.	
This column is only to be used in making monthly or quarterly payments.			*Days.*		*Days.*		*Days.*	
			1	$4.44	1	$4.40	1	$4.35
			2	8.89	2	8.79	2	8.70
FIRST QUARTER.			3	13.33	3	13.19	3	13.04
January,	31 days...	$137.80	4	17.78	4	17.58	4	17.39
February,	28 days...	124.40	5	22.22	5	21.98	5	21.74
March,	31 days...	137.80	6	26.67	6	26.37	6	26.09
		400.00	7	31.11	7	30.77	7	30.43
			8	35.56	8	35.16	8	34.78
SECOND QUARTER.			9	40.00	9	39.56	9	39.13
April,	30 days...	$131.90	10	44.44	10	43.96	10	43.48
May,	31 days...	136.20	11	48.89	11	48.35	11	47.83
June,	30 days...	131.90	12	53.33	12	52.75	12	52.17
		400.00	13	57.78	13	57.14	13	56.52
			14	62.22	14	61.54	14	60.87
THIRD QUARTER.			15	66.67	15	65.93	15	65.22
July,	31 days...	$134.80	16	71.11	16	70.33	16	69.57
August,	31 days...	134.80	17	75.56	17	74.73	17	73.91
September,	30 days...	130.40	18	80.00	18	79.12	18	78.26
		400.00	19	84.44	19	83.52	19	82.61
			20	88.89	20	87.91	20	86.96
FOURTH QUARTER.			21	93.33	21	92.31	21	91.30
October,	31 days...	$134.80	22	97.78	22	96.70	22	95.65
November,	30 days...	130.40	23	102.22	23	101.10	23	100.00
December,	31 days...	134.80	24	106.67	24	105.49	24	104.35
		400.00	25	111.11	25	109.89	25	108.70
			26	115.56	26	114.29	26	113.04
LEAP YEAR—FIRST QUARTER.			27	120.00	27	118.68	27	117.39
January,	31 days...	$136.30	28	124.44	28	123.08	28	121.74
February,	29 days...	127.40	29	128.89	29	127.47	29	126.09
March,	31 days...	136.30	30	133.33	30	131.87	30	130.43
		400.00	31	137.78	31	136.26	31	134.78

NOTE.—For fractional parts of any month in the first quarter of leap year, use the column under second quarter, the rate of pay being the same.

Table for payment of annual or quarterly salaries—Continued.

$1,400 PER ANNUM.

$350 per quarter.			First quarter, 90 days.		Second quarter, 91 days.		Third and fourth quarters, 92 days.	
This column is only to be used in making monthly or quarterly payments.			*Days.*		*Days.*		*Days.*	
			1	$3.89	1	$3.85	1	$3.80
			2	7.78	2	7.69	2	7.61
FIRST QUARTER.			3	11.67	3	11.54	3	11.41
January,	31 days...	$120.60	4	15.56	4	15.38	4	15.22
February,	28 days...	108.80	5	19.44	5	19.23	5	19.02
March,	31 days...	120.60	6	23.33	6	23.08	6	22.83
		350.00	7	27.22	7	26.92	7	26.63
			8	31.11	8	30.77	8	30.43
SECOND QUARTER.			9	35.00	9	34.62	9	34.24
April,	30 days...	$115.40	10	38.89	10	38.46	10	38.04
May,	31 days...	119.20	11	42.78	11	42.31	11	41.85
June,	30 days...	115.40	12	46.67	12	46.15	12	45.65
		350.00	13	50.56	13	50.00	13	49.46
			14	54.44	14	53.85	14	53.26
THIRD QUARTER.			15	58.33	15	57.69	15	57.07
July,	31 days...	$117.90	16	62.22	16	61.54	16	60.87
August,	31 days...	117.90	17	66.11	17	65.38	17	64.67
September,	30 days...	114.20	18	70.00	18	69.23	18	68.48
		350.00	19	73.89	19	73.08	19	72.28
			20	77.78	20	76.92	20	76.09
FOURTH QUARTER.			21	81.67	21	80.77	21	79.89
October,	31 days...	$117.90	22	85.56	22	84.62	22	83.70
November,	30 days...	114.20	23	89.44	23	88.46	23	87.50
December,	31 days...	117.90	24	93.33	24	92.31	24	91.30
		350.00	25	97.22	25	96.15	25	95.11
LEAP YEAR—FIRST QUARTER.			26	101.11	26	100.00	26	98.91
			27	105.00	27	103.85	27	102.72
January,	31 days...	$119.20	28	108.89	28	107.69	28	106.52
February,	29 days...	111.60	29	112.78	29	111.54	29	110.33
March,	31 days...	119.20	30	116.67	30	115.38	30	114.13
		350.00	31	120.56	31	119.23	31	117.93

NOTE.—For fractional parts of any month in the first quarter of leap year, use the column under second quarter, the rate of pay being the same.

Table for payment of annual or quarterly salaries—Continued.

$1,200 PER ANNUM.

$300 per quarter.		First quarter, 90 days.		Second quarter, 91 days.		Third and fourth quarters, 92 days.	
This column is only to be used in making monthly or quarterly payments.		*Days.*		*Days.*		*Days.*	
		1	$3.33	1	$3.30	1	$3.26
		2	6.67	2	6.59	2	6.52
FIRST QUARTER.		3	10.00	3	9.89	3	9.78
January,	31 days... $103.30	4	13.33	4	13.19	4	13.04
February,	28 days... 93.40	5	16.67	5	16.48	5	16.30
March,	31 days... 103.30	6	20.00	6	19.78	6	19.57
	300.00	7	23.33	7	23.08	7	22.83
		8	26.67	8	26.37	8	26.09
SECOND QUARTER.		9	30.00	9	29.67	9	29.35
April,	30 days... $98.90	10	33.33	10	32.97	10	32.61
May,	31 days... 102.20	11	36.67	11	36.26	11	35.87
June,	30 days... 98.90	12	40.00	12	39.56	12	39.13
	300.00	13	43.33	13	42.86	13	42.39
		14	46.67	14	46.15	14	45.65
THIRD QUARTER.		15	50.00	15	49.45	15	48.91
July,	31 days... $101.10	16	53.33	16	52.75	16	52.17
August,	31 days... 101.10	17	56.67	17	56.04	17	55.43
September,	30 days... 97.80	18	60.00	18	59.34	18	58.70
	300.00	19	63.33	19	62.64	19	61.96
		20	66.67	20	65.93	20	65.22
FOURTH QUARTER.		21	70.00	21	69.23	21	68.48
October,	31 days... $101.10	22	73.33	22	72.53	22	71.74
November,	30 days... 97.80	23	76.67	23	75.82	23	75.00
December,	31 days... 101.10	24	80.00	24	79.12	24	78.26
	300.00	25	83.33	25	82.42	25	81.52
LEAP YEAR—FIRST QUARTER.		26	86.67	26	85.71	26	84.78
January,	31 days... $102.20	27	90.00	27	89.01	27	88.04
February,	29 days... 95.60	28	93.33	28	92.31	28	91.30
March,	31 days... 102.20	29	96.67	29	95.60	29	94.57
	300.00	30	100.00	30	98.90	30	97.83
		31	103.33	31	102.20	31	101.09

NOTE.—For fractional parts of any month in the first quarter of leap year, use the column under second quarter, the rate of pay being the same.

Table for payment of annual or quarterly salaries—Continued.

$1,000 PER ANNUM.

$250 per quarter.			First quarter, 90 days.		Second quarter, 91 days.		Third and fourth quarters, 92 days.	
This column is only to be used in making monthly or quarterly payments.			*Days.*		*Days.*		*Days.*	
			1	$2.78	1	$2.75	1	$2.72
			2	5.56	2	5.49	2	5.43
FIRST QUARTER.			3	8.33	3	8.24	3	8.15
January,	31 days...	$86.10	4	11.11	4	10.99	4	10.87
February,	28 days...	77.80	5	13.89	5	13.74	5	13.59
March,	31 days...	86.10	6	16.67	6	16.48	6	16.30
		250.00	7	19.44	7	19.23	7	19.02
			8	22.22	8	21.98	8	21.74
SECOND QUARTER.			9	25.00	9	24.73	9	24.46
April,	30 days...	$82.40	10	27.78	10	27.47	10	27.17
May,	31 days...	85.20	11	30.56	11	30.22	11	29.89
June,	30 days...	82.40	12	33.33	12	32.97	12	32.61
		250.00	13	36.11	13	35.71	13	35.33
			14	38.89	14	38.46	14	38.04
THIRD QUARTER.			15	41.67	15	41.21	15	40.76
July,	31 days...	$84.20	16	44.44	16	43.96	16	43.48
August,	31 days...	84.20	17	47.22	17	46.70	17	46.20
September,	30 days...	81.60	18	50.00	18	49.45	18	48.91
		250.00	19	52.78	19	52.20	19	51.63
			20	55.56	20	54.95	20	54.35
FOURTH QUARTER.			21	58.33	21	57.69	21	57.07
October,	31 days...	$84.20	22	61.11	22	60.44	22	59.78
November,	30 days...	81.60	23	63.89	23	63.19	23	62.50
December,	31 days...	84.20	24	66.67	24	65.93	24	65.22
		250.00	25	69.44	25	68.68	25	67.93
			26	72.22	26	71.43	26	70.65
LEAP YEAR—FIRST QUARTER.			27	75.00	27	74.18	27	73.37
January,	31 days...	$85.20	28	77.78	28	76.92	28	76.09
February,	29 days...	79.60	29	80.56	29	79.67	29	78.80
March,	31 days...	85.20	30	83.33	30	82.42	30	81.52
		250.00	31	86.11	31	85.16	31	84.24

NOTE.—For fractional parts of any month in the first quarter of leap year, use the column under second quarter, the rate of pay being the same.

Toble for payment of annual or quarterlg salaries—Continued.

$900 PER ANNUM.

$225 per quarter.			First quarter, 90 days.		Second quarter, 91 days.		Third and fourth quarters, 92 days.	
This column is only to be used in making monthly or quarterly payments.			*Days.*		*Days.*		*Days.*	
			1	$2.50	1	$2.47	1	$2.45
			2	5.00	2	4.95	2	4.89
FIRST QUARTER.			3	7.50	3	7.42	3	7.34
January,	31 days...	$77.50	4	10.00	4	9.89	4	9.78
February,	28 days...	70.00	5	12.50	5	12.36	5	12.23
March,	31 days...	77.50	6	15.00	6	14.84	6	14.67
		225.00	7	17.50	7	17.31	7	17.12
			8	20.00	8	19.78	8	19.57
SECOND QUARTER.			9	22.50	9	22.25	9	22.01
April,	30 days...	$74.20	10	25.00	10	24.73	10	24.46
May,	31 days...	76.60	11	27.50	11	27.20	11	26.90
June,	30 days...	74.20	12	30.00	12	29.67	12	29.35
		225.00	13	32.50	13	32.14	13	31.79
			14	35.00	14	34.62	14	34.24
THIRD QUARTER.			15	37.50	15	37.09	15	36.68
July,	31 days...	$75.80	16	40.00	16	39.56	16	39.13
August,	31 days...	75.80	17	42.50	17	42.03	17	41.58
September,	30 days...	73.40	18	45.00	18	44.51	18	44.02
		225.00	19	47.50	19	46.98	19	46.47
			20	50.00	20	49.45	20	48.91
FOURTH QUARTER.			21	52.50	21	51.92	21	51.36
October,	31 days...	$75.80	22	55.00	22	54.40	22	53.80
November,	30 days...	73.40	23	57.50	23	56.87	23	56.25
December,	31 days...	75.80	24	60.00	24	59.34	24	58.70
		225.00	25	62.50	25	61.81	25	61.14
LEAP YEAR—FIRST QUARTER.			26	65.00	26	64.29	26	63.59
January,	31 days...	$76.60	27	67.50	27	66.76	27	66.03
February,	29 days...	71.80	28	70.00	28	69.23	28	68.48
March,	31 days...	76.60	29	72.50	29	71.70	29	70.92
		225.00	30	75.00	30	74.18	30	73.37
			31	77.50	31	76.65	31	75.82

NOTE.—For fractional parts of any month in the first quarter of leap year, use the column under second quarter, the rate of pay being the same.

Table for payment of annual or quarterly salaries—Continued.

$840 PER ANNUM.

$210 per quarter.			First quarter, 90 days.		Second quarter, 91 days.		Third and fourth quarters, 92 days.	
This column is only to be used in making monthly or quarterly payments.			*Days.*		*Days.*		*Days.*	
			1	$2.33	1	$2.31	1	$2.28
			2	4.67	2	4.62	2	4.57
FIRST QUARTER.			3	7.00	3	6.92	3	6.85
January,	31 days...	$72.30	4	9.33	4	9.23	4	9.13
February,	28 days...	65.40	5	11.67	5	11.54	5	11.41
March,	31 days...	72.30	6	14.00	6	13.85	6	13.70
		210.00	7	16.33	7	16.15	7	15.98
			8	18.67	8	18.46	8	18.26
SECOND QUARTER.			9	21.00	9	20.77	9	20.54
April,	30 days...	$69.20	10	23.33	10	23.08	10	22.83
May,	31 days...	71.60	11	25.67	11	25.38	11	25.11
June,	30 days...	69.20	12	28.00	12	27.69	12	27.39
		210.00	13	30.33	13	30.00	13	29.67
			14	32.67	14	32.31	14	31.96
THIRD QUARTER.			15	35.00	15	34.62	15	34.24
July,	31 days...	$70.80	16	37.33	16	36.92	16	36.52
August,	31 days...	70.80	17	39.67	17	39.23	17	38.80
September,	30 days...	68.40	18	42.00	18	41.54	18	41.09
		210.00	19	44.33	19	43.85	19	43.37
			20	46.67	20	46.15	20	45.65
FOURTH QUARTER.			21	49.00	21	48.46	21	47.93
October,	31 days...	$70.80	22	51.33	22	50.77	22	50.22
November,	30 days...	68.40	23	53.67	23	53.08	23	52.50
December,	31 days...	70.80	24	56.00	24	55.38	24	54.78
		210.00	25	58.33	25	57.69	25	57.07
LEAP YEAR—FIRST QUARTER.			26	60.67	26	60.00	26	59.35
			27	63.00	27	62.31	27	61.63
January,	31 days...	$71.50	28	65.33	28	64.62	28	63.91
February,	29 days...	67.00	29	67.67	29	66.92	29	66.20
March,	31 days...	71.50	30	70.00	30	69.23	30	68.48
		210.00	31	72.33	31	71.54	31	70.76

NOTE.—For fractional parts of any month in the first quarter of leap year, use the column under second quarter, the rate of pay being the same.

Table for payment of annual or quarterly salaries—Continued.

$720 PER ANNUM.

$180 per quarter.			First quarter, 90 days.		Second quarter, 91 days.		Third and fourth quarters, 92 days.	
This column is only to be used in making monthly or quarterly payments.			*Days.*		*Days.*		*Days.*	
			1	$2.00	1	$1.98	1	$1.96
			2	4.00	2	3.96	2	3.91
FIRST QUARTER.			3	6.00	3	5.93	3	5.87
January,	31 days...	$62.00	4	8.00	4	7.91	4	7.83
February,	28 days...	56.00	5	10.00	5	9.89	5	9.78
March,	31 days...	62.00	6	12.00	6	11.87	6	11.74
		180.00	7	14.00	7	13.85	7	13.70
SECOND QUARTER.			8	16.00	8	15.82	8	15.65
			9	18.00	9	17.80	9	17.61
April,	30 days...	$59.30	10	20.00	10	19.78	10	19.57
May,	31 days...	61.40	11	22.00	11	21.76	11	21.52
June,	30 days...	59.30	12	24.00	12	23.74	12	23.48
		180.00	13	26.00	13	25.71	13	25.43
THIRD QUARTER.			14	28.00	14	27.69	14	27.39
			15	30.00	15	29.67	15	29.35
July,	31 days...	$60.60	16	32.00	16	31.65	16	31.30
August,	31 days...	60.60	17	34.00	17	33.63	17	33.26
September,	30 days...	58.80	18	36.00	18	35.60	18	35.22
		180.00	19	38.00	19	37.58	19	37.17
FOURTH QUARTER.			20	40.00	20	39.56	20	39.13
			21	42.00	21	41.54	21	41.09
October,	31 days...	$60.60	22	44.00	22	43.52	22	43.04
November,	30 days...	58.80	23	46.00	23	45.49	23	45.00
December,	31 days...	60.60	24	48.00	24	47.47	24	46.96
		180.00	25	50.00	25	49.45	25	48.91
LEAP YEAR—FIRST QUARTER.			26	52.00	26	51.43	26	50.87
			27	54.00	27	53.41	27	52.83
January,	31 days...	$61.30	28	56.00	28	55.38	28	54.78
February,	29 days...	57.40	29	58.00	29	57.36	29	56.74
March,	31 days...	62.30	30	60.00	30	59.34	30	58.70
		180.00	31	62.00	31	61.32	31	60.65

NOTE.—For fractional parts of any month in the first quarter of leap year, use the column under second quarter, the rate of pay being the same.

Table for payment of annual or quarterly salaries—Continued.

$600 PER ANNUM.

$150 per quarter.			First quarter, 90 days.		Second quarter, 91 days.		Third and fourth quarters, 92 days.	
This column is only to be used in making monthly or quarterly payments.			*Days.*		*Days.*		*Days.*	
			1	$1.67	1	$1.65	1	$1.63
			2	3.33	2	3.30	2	3.26
FIRST QUARTER.			3	5.00	3	4.95	3	4.89
January,	31 days...	$51.70	4	6.67	4	6.59	4	6.52
February,	28 days...	46.60	5	8.33	5	8.24	5	8.15
March,	31 days...	51.70	6	10.00	6	9.89	6	9.78
		150.00	7	11.67	7	11.54	7	11.41
			8	13.33	8	13.19	8	13.04
SECOND QUARTER.			9	15.00	9	14.84	9	14.67
April,	30 days...	$49.50	10	16.67	10	16.48	10	16.30
May,	31 days...	51.00	11	18.33	11	18.13	11	17.93
June,	30 days...	49.50	12	20.00	12	19.78	12	19.57
		150.00	13	21.67	13	21.43	13	21.20
			14	23.33	14	23.08	14	22.83
THIRD QUARTER.			15	25.00	15	24.73	15	24.46
July,	31 days...	$50.50	16	26.67	16	26.37	16	26.09
August,	31 days...	50.50	17	28.33	17	28.02	17	27.72
September,	30 days...	49.00	18	30.00	18	29.67	18	29.35
		150.00	19	31.67	19	31.32	19	30.98
			20	33.33	20	32.97	20	32.61
FOURTH QUARTER.			21	35.00	21	34.62	21	34.24
October,	31 days...	$50.50	22	36.67	22	36.26	22	35.87
November,	30 days...	49.00	23	38.33	23	37.91	23	37.50
December,	31 days...	50.50	24	40.00	24	39.56	24	39.13
		150.00	25	41.67	25	41.21	25	40.76
LEAP YEAR—FIRST QUARTER.			26	43.33	26	42.86	26	42.39
			27	45.00	27	44.51	27	44.02
January,	31 days...	$51.10	28	46.67	28	46.15	28	45.65
February,	29 days...	47.80	29	48.33	29	47.80	29	47.28
March,	31 days...	51.10	30	50.00	30	49.45	30	48.91
		150.00	31	51.67	31	51.10	31	50.54

NOTE.—For fractional parts of any month in the first quarter of leap year, use the column under second quarter, the rate of pay being the same.

Table for payment of annual or quarterly salaries—Continued.

$480 PER ANNUM.

$120 per quarter.			First quarter, 90 days.		Second quarter, 91 days.		Third and fourth quarters, 92 days.	
This column is only to be used in making monthly or quarterly payments.			*Days.*		*Days.*		*Days.*	
			1	$1.33	1	$1.32	1	$1.30
			2	2.67	2	2.64	2	2.61
FIRST QUARTER.			3	4.00	3	3.96	3	3.91
January,	31 days...	$41.30	4	5.33	4	5.27	4	5.22
February,	28 days...	37.40	5	6.67	5	6.59	5	6.52
March,	31 days...	41.30	6	8.00	6	7.91	6	7 83
		120.00	7	9.33	7	9.23	7	9.13
			8	10.67	8	10.55	8	10.43
SECOND QUARTER.			9	12.00	9	11.87	9	11.74
April,	30 days...	$39.60	10	13.33	10	13.19	10	13.04
May,	31 days...	40.80	11	14.67	11	14.51	11	14.35
June,	30 days...	39.60	12	16.00	12	15.82	12	15.65
		120.00	13	17.33	13	17.14	13	16.96
			14	18.67	14	18.46	14	18.26
THIRD QUARTER.			15	20.00	15	19.78	15	19.57
July,	31 days...	$40.40	16	21.33	16	21.10	16	20.87
August,	31 days...	40.40	17	22.67	17	22.42	17	22.17
September,	30 days...	39.20	18	24.00	18	23.74	18	23.48
		120.00	19	25.33	19	25.05	19	24.78
			20	26.67	20	26.37	20	26.00
FOURTH QUARTER.			21	28.00	21	27.69	21	27.39
October,	31 days...	$40.40	22	29.33	22	29.01	22	28.70
November,	30 days...	39.20	23	30.67	23	30.33	23	30.00
December,	31 days...	40.40	24	32.00	24	31.65	24	31.30
		120.00	25	33.33	25	32.97	25	32.61
LEAP YEAR—FIRST QUARTER.			26	34.67	26	34.29	26	33.91
			27	36.00	27	35.60	27	35.22
January,	31 days...	$40.90	28	37.33	28	36.92	28	36.52
February,	29 days...	38.20	29	38.67	29	38.24	29	37.83
March,	31 days...	40.90	30	40.00	30	39.56	30	39.13
		120.00	31	41.33	31	40.88	31	40.43

NOTE.—For fractional parts of any month in the first quarter of leap year, use the column under second quarter, the rate of pay being the same.