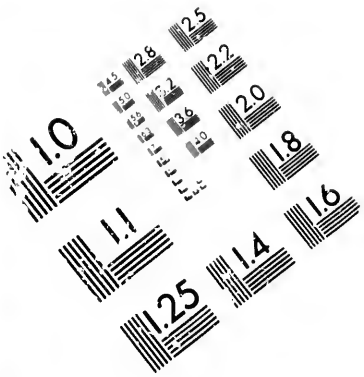

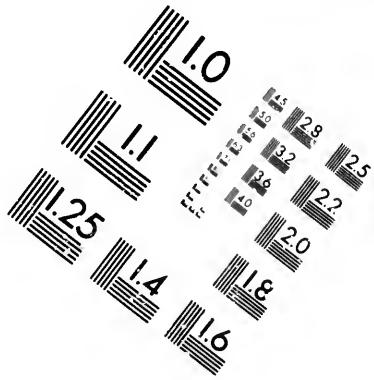

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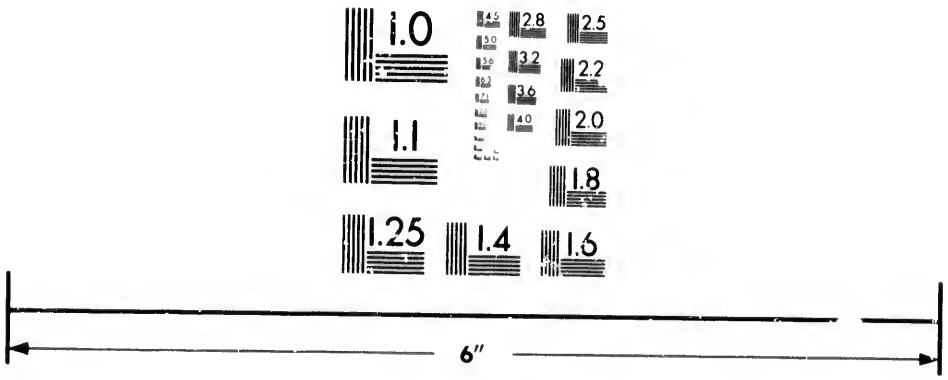

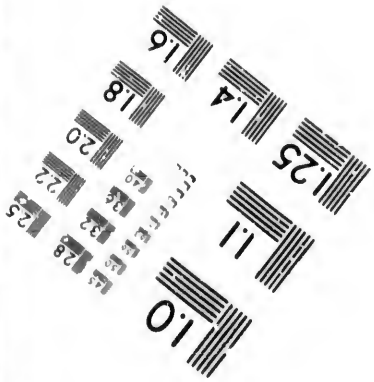

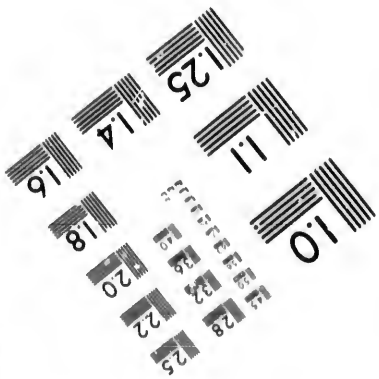

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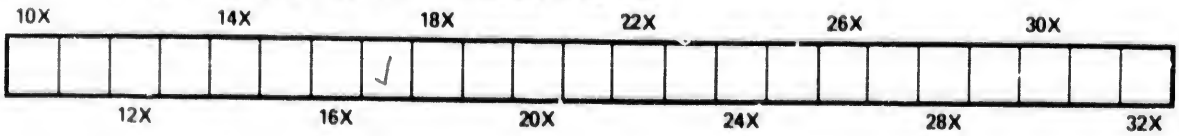

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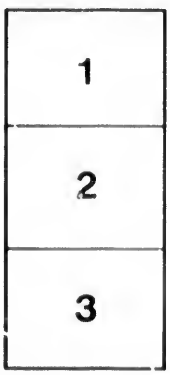

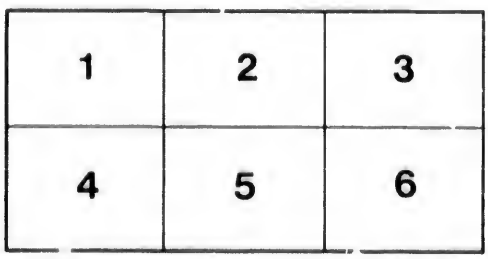

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THE

Canadian Contractor's Hand-Book,

A COMPENDIUM OF

USEFUL INFORMATION

FOR PERSONS ENGAGED ON WORKS OF CONSTRUCTION.

SECOND EDITION

PUBLISHED BY

CHAS. H. MORTIMER,

TORONTO, CANADA.

TORONTO:
CANADIAN ARCHITECT AND BUILDER PRESS,
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PREFACE TO SECOND EDITION.

THE first edition of the CANADIAN CONTRACTOR'S HAND-BOOK was issued in 1889. For a time the book was given as a premium to new subscribers to the CANADIAN ARCHITECT AND BUILDER with the object of introducing that journal, which was then in its infancy, as rapidly and widely as possible to Canadian builders.

Since ceasing to use the book for this purpose, there has been such an unexpected demand for it on the part of contractors, architects and others, as to make it appear desirable to publish this second edition.

The contents of the first edition have been thoroughly revised, and any data not applicable to the present time omitted. Upwards of seventy-five pages of new and most valuable information have been added to the present edition.

It is hoped that the Hand-Book in its present form and at the reasonable price at which it is offered, will commend itself to Canadian builders, contractors, architects, etc., for whose information especially it has been compiled.

THE PUBLISHER.

TABLE OF CONTENTS.

THE MECHANICS' LIEN ACT.

HER Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows :— Short Title.

I. This Act may be cited as " The Mechanics' Lien Act." R. S. O. 1877, C. 120, S. 1.

II. Where the following words occur in this Act, or in the schedules thereto, they shall be construed in the manner hereinafter mentioned, unless a contrary intention appears :— Interpretation.

1 " Contractor " shall mean a person with or employed directly by the owner for the doing of work or placing or furnishing of machinery or materials for any of the purposes mentioned in this Act ; "Contractor."

2 " Sub-contractor" shall mean a person not contracting with or employed directly by the owner for the purposes aforesaid, but contracting with or employed by the " contractor " or under him by another " sub-contractor ;" "Sub-Contractor."

3. "Owner " shall extend to and include a person having any estate or interest in the lands upon or in respect of which the work is done, or materials or machinery are placed or furnished, at whose request and upon whose credit or upon whose behalf or with whose privity or consent or for whose direct benefit any such work is done, or materials or machinery placed or furnished, and all persons claiming under him, whose rights are acquired after the work in respect of which the lien is claimed is commenced, or the materials or the machinery furnished have been commenced to be furnished. R. S. O. 1877, C. 120, S. 2.

III. No agreement shall be held to deprive anyone otherwise entitled to a lien under this Act, and not a party to the agreement, of the benefit of the lien, but the lien shall attach, notwithstanding such agreement. 47 V. C. 18, S. 1, *part.* Person not deprived of lien by agreement, unless a party thereto.

4. Unless he signs an express agreement to the contrary, every mechanic, machinst, builder, miner, laborer, contractor or other person doing work upon, or furnishing materials to be used in, the construction, alteration or repair of any building or erection, or erecting, furnishing or placing machinery of any kind in, upon or in connection with any building, erection or mine, shall by virtue of being so employed or furnishing, have a lien for the price of the work, machinery or materials, upon the building, erection or mine, and the lands occupied thereby or enjoyed therewith, limited in amount to the sum justly due to the person entitled to the lien. R. S. O. 1877, c. 120, s. 3 ; 47 V. c. 18, s. 1, *part.* Mechanics and others to have liens for work done, etc.

V. (1) The lien shall attach upon the estate and interest of the owner, as defined by this Act, in the building, erection or mine upon or in respect of which the work is done or the materials or machinery placed or furnished, and the land occupied thereby or enjoyed therewith. Upon what property the lien shall attach.

(2). In cases where the estate or interest charged by the lien is leasehold, the fee simple may also, with the consent of the owner thereof, be subject to said charge, provided such consent is testified by the signature of such owner upon the claim at the time of the registering thereof, and duly verified. R. S. O. 1877, c. 120, s. 6, 47 V. c. 18 s. 5. When the estate charged is leasehold, The fee may be charged in certain cases.

Mortgaged land.

(3) In case the land upon or in respect of which any work as aforesaid is executed, or labor performed or upon which materials or machinery are placed is incumbered by a prior mortgage or other charge, and the selling value of the land is increased by the construction alteration or repairs of the building, or by the erection or placing of the materials or machinery, the lien under this Act shall be entitled to rank upon the increased value in priority to the mortgage or other charge. R. S. O. 1877, c. 120, s. 7; 45 V. c. 15, s. 13.

Lien for 30 days' wages.

VI. (1). Without prejudice to any lien which he may have under the preceding sections, every mechanic, laborer or or other person who performs labor for wages upon the construction, alteration or repairs of any building or erection, or in erecting or placing machinery of any kind in, upon, or in connection with, any building, erection, or mine, shall to the extent of the interest of the owner have, upon the building, erection, or mine, and the land occupied thereby and enjoyed therewith, a lien for such wages, not exceeding the wages of thirty days, or a balance equal to his wages for thirty days.

Property affected.

(2). The lien for wages given by this section shall attach when the labor is in respect of a building, erection or mine belonging to the wife of the person at whose instance the work is done upon the estate or interest of the wife in such property, as well as upon that of her husband. 45 Vict. c. 15, ss. 2, 3.

Owner may retain 10 per cent. of contract price.

VII. In all cases, the owner shall, in the absence of a stipulation to the contrary, be entitled to retain for a period of thirty days after the completion of the contract, ten per centum of the price to be paid to the contractor. 45 V. c. 15, s. 5.

Claim by sub-contractor limited.

VIII. In case the lien is claimed by a sub-contractor, the amount which may be claimed in respect thereof shall be limited to the amount payable to the contractor or sub-contractor (as the case may be) for whom the work has been done, or materials or machinery have been furnished or placed. R. S. O. 1877, c. 120, s. 6.

Certain payments to discharge the lien.

IX.—(1). All payments, up to ninety per centum of the price to be paid for the work, machinery or materials, as defined by section 4 of this Act, made in good faith by the owner to the contractor, or by the contractor to the sub-contractor, or by one sub-contractor to another sub-contractor, before notice in writing, by the person claiming the lien has been given to such owner, contractor or sub-contractor (as the case may be), of the claim of such person, shall operate as a discharge *pro tanto* of the lien created by this Act, but this section shall not apply to any payment made for the purpose of defeating or impairing a claim to a lien existing or arising under this Act. 41 Vic. c. 17, s. 1.

Lien to extent of 10 per cent. when a charge.

(2). A lien shall, in addition to all other rights or remedies given by this Act, also operate as a charge to the extent of ten per centum of the price to be paid by the owner for the work, machinery or materials as defined by section 4 of this Act up to ten days after the completion of the work or of the delivery of the materials, in respect of which such lien exists, and no longer, unless notice in writing be given as herein provided. 41 V. c. 17, s. 2.

(3). A lien for wages for thirty days, or for a balance equal to

the wages for thirty days, shall, to the extent of the said ten per cent. of the price to be paid to the contractor, have priority over all other liens under this Act, and over any claim by the owner against the contractor for, or in consequence of the failure of the latter to complete his contract. 45 V. c. 15, s. 4.

Priority of lien for 30 days' wages.

X. Save as herein provided, the lien shall not attach so as to make the owner liable to a greater sum than the sum payable by the owner to the contractor. R. S. O. 1877, c. 120, S. 6, *part;* 45. V. C. 15, S. 4.

Extent of owners' liability.

XI. All persons furnishing material or doing labor for the person having a lien under this Act, in respect of the subject of such lien, who notify the owner of the premises sought to be affected thereby, within thirty days after such material is furnished, or labor performed, of an unpaid account or demand against such lien-holder, for such material or labor, shall be entitled, subject to the provisions of sections 6 and 9, payable by such owner, under said lien ; and if the owner thereupon pays the amount of such charge to the person furnishing material, and doing labor as aforesaid, such payment shall be deemed a satisfaction *pro tanto* of such lien. R. S. O. 1877, c. 120, s. 8.

Notice to owner of claims against lien-holders.

XII. In case of a dispute as to the validity or amount of an unpaid account or demand, of which notice is given to the owner under the preceding section, the same shall be first determined by action in the proper court in that behalf, or by arbitration, in manner mentioned in section 14 at the option of the person having the unpaid account or demand against the lien holder ; and pending the proceedings to determine the dispute, so much of the amount of the lien as is in question therein may be withheld from the person claiming the lien. R. S. O. 1877, c. 120, s. 9.

Disputes as to claims against lien-holders.

XIII. In case the person primarily liable to the person giving such notice as mentioned in section 11 fails to pay the amount awarded within ten days after the award is made, the owner, contractor or sub-contractor may pay the same out of any moneys due by him to the person primarily liable as aforesaid, on account of the work done or materials or machinery furnished or placed in respect of which the debt arose ; and such payment if made after an award (or if made without any arbitration having been previously had or dispute existing, then, if the debt in fact existed and to the extent thereof,) shall operate as a discharge *pro tanto* of the moneys so due as aforesaid to the person primarily liable. R. S. O. 1877, c. 120, s. 10.

Failure to pay amount awarded.

XIV. (1.) In case a claim is made by a sub-contractor in respect of a lien to which he is entitled, and a dispute arises as to the amount due or payable in respect thereof, the same shall be settled by arbitration.

Disputed claims of sub-contractors to be referred to arbitration

(2). One arbitrator shall be appointed by the person making the claim, one by the person by whom he was employed, and the third arbitrator shall be appointed by the two so chosen.

Appointment of arbitrators.

(3). The decision of the arbitrators or a majority of them shall be final and conclusive. R. S. O. 1877, c. 120, s. 18.

Decision to be final.

(4). In case either of the parties interested in any such dispute, refuses or neglects within three days after notice in writing requiring him to do so, to appoint an arbitrator, or if the arbitra-

Refusal to appoint arbitrators.

tors appointed fail to agree upon a third, the appointment may be made by a County Judge of the county in which the lands in respect of which the lien is claimed are situate. R. S. O. 1877, c. 120. s. 19.

Property affected by the lien not to be removed.

XV. During the continuance of a lien, no portion of the property or machinery affected thereby, shall be removed to the prejudice of the lien; and any attempt at such removal may be restrained by application to the County Court or the Judge thereof, or the High Court respectively, according as the claim is under or over the sum of $200. R. S. O. 1877, c. 120, s. 22.

Claim may be registered.

XVI. (1). A claim of lien applicable to the case, may be registered in the registry division in which the land is situate, and shall state:

(*a*). The name and residence of the claimant and of the owner of the property to be charged, and of the person for whom and upon whose credit the work is done or materials or machinery furnished, and the time or period within which the same was, or was to be, done or furnished;

(*b*) The work done or materials or machinery furnished;

(*c*) The sum claimed as due, or to become due;

(*d*) The description of the land to be charged;

(*e*) The date of expiry of the period of credit agreed to by the lien-holder for payment for his work, materials or machinery, where credit has been given.

Affidavit of verification may be made by agent or assignee.

(2). The claim may be one of the forms given in the schedule in this Act, and shall be verified by the affidavit of the claimant, or of his agent or assignee having full knowledge of the matters required to be verified, and the affidavit of an agent or assignee shall state he has such knowledge. R. S. O. 1877, c. 120, s. 4 (1, 2); 47 V. c. 18, ss. 2, 3.

Claims for wages may be combined.

XVII. A claim for wages may include the claims of any number of mechanics, laborers, or other persons aforesaid, who may choose to unite therein. In such case each claimant shall verify his claim by his affidavit, but need not repeat the facts set out in the claim; and an affidavit substantially in accordance with form 4 in the schedule to this Act, shall be sufficient: 45 V. c. 15, ss. 8, 10.

Registration of claims

XVIII. (1). The registrar, upon payment of his fee, shall register the claim, so that the same may appear as an incumbrance against the land therein described. R. S. O. 1877, c. 120, s. 5; 47 V. c. 18, s 4, *part*.

Fee.

(2). The fee for registration shall be twenty-five cents; if several persons join in one claim, the registrar shall have a further fee of ten cents for every person after the first. 45 V. c. 15, s. 11.

Mode of registration.

(3). The registrar shall not be bound to copy in any registry book any claim or affidavit, but he shall number each claim, and shall insert in the alphabetic and abstract indexes, the like particulars as in other cases; he may describe the nature of the instrument as "Mechanics' Lien." 45 V. c. 15, s. 11.

Registry Act to apply. Rev. Stat., c. 114.

XIX. Where a claim is so registered, the person entitled to the lien shall be deemed a purchaser *pro tanto*, and within the provisions of *The Registry Act*, but except as herein otherwise

provided, *The Registry Act* shall not apply to any lien arising under this Act. R. S. O. 1877, c. 120, ss. 4 (3), 26.

XX. (1). Where the lien is for wages under sections 6 or 9, the claim may be registered,

(*a*) At any time within thirty days after the last day's labor for which the wages are payable, or

Time for registration of claim for wages.

(*b*) At any time within thirty days after the completion of the construction, alteration or repair of the building or erection, or after the erecting or placing of the machinery, or in towards which, respectively, the labor was performed and the wages earned, but so that the whole period shall not exceed sixty days from the last day's labor aforesaid.

(2). Such lien shall not be entitled to the benefit of the provisions of sections 6 and 9 after the said respective periods, unless the same is duly registered before the expiration of the said periods so limited. 45 V. c. 15, s. 6.

(3). Such lien shall have the same priority for all purposes after as before registration.

XXI. In other cases the claim may be registered before or during the progress of the work, or within thirty days from the completion thereof, or from the supplying or placing the machinery. 45 V. c. 15, s. 7.

Time for registering claim not arising under s. 5.

XXII. Every lien which has not been duly registered under the provisions of this Act shall absolutely cease to exist on the expiration of the time hereinbefore limited for the registration thereof, unless in the meantime proceedings are instituted to realize the claim under the provisions of this Act, and a certificate thereof (which may be granted by the Court or a Judge before whom or in which the proceedings are instituted), is duly registered in the registry office of the registry division wherein the lands in respect of which the lien is claimed are situate. R. S. O. 1877, c. 120, s. 20.

When unregistered lien shall cease.

XXIII. Every lien which has been duly registered under the provision of this Act shall absolutely cease to exist after the expiration of ninety days after the work has been completed, or materials or machinery furnished, or wages earned, or the expiry of the period of credit, where such period is mentioned in the claim of lien filed, unless in the meantime proceedings are instituted to realize the claim under the provisions of this Act, and a certificate thereof (which may be granted by the Court or Judge before whom or in which the proceedings are instituted), is duly registered in the registry office of the registry division wherein the lands in respect of which the lien is claimed are situate. R. S. O. 1877, c. 120, s. 21.

When registered lien shall cease.

XXIV. If there is no period of credit, or if the date of expiry of the period of credit is not stated in the claim so filed, the lien shall cease to exist upon the expiration of ninety days after the work has been completed or materials or machinery furnished, unless in the meantime proceedings shall have been instituted pursuant to section 23 of this Act. 47 V. c. 18, s. 2.

When lien to cease.

XXV. In the event of the death of a lien-holder, his right of lien shall pass to his personal representatives; and the right of a lien-holder may be assigned by any instrument in writing. R. S. O. 1877, c. 120, s. 16.

Death of lien-holder.

Discharge of liens.

XXVI. A lien may be discharged by a receipt signed by the claimant, or his agent, duly authorized in writing, acknowledging payment, and verified by affidavit and filed; such receipt shall be numbered and entered by the registrar like other instruments, but need not be copied in any book; the fees shall be the same as for registering a claim or lien. 45 V. c. 15, s. 15; 47 V. c. 18, s. 4.

Cost of registering discharge.

XXVII. Where there is a contract for the execution of the work, as hereinbefore mentioned, the registration of all discharges of liens shall be at the cost of the contractor, unless a court or judge otherwise orders. 45 V. c. 15, s. 16; 47 V. c. 18, s. 4.

Enforcement of lien in a Division Court.

XXVIII. (1) Where the amount of the claims in respect of any lien is within the jurisdiction of the County or Division Courts respectively, proceedings to recover the same, according to the usual procedure of the said court by judgment and execution, may be taken in the proper Division Court or in the County Court of the County in which the land charged is situate; or proceedings may be taken before the judge of the said courts, who may proceed in a summary manner by summons and order, and may take accounts and make requisite enquiries, and in default of payment may direct the sale of the estate and interest charged, and such further proceedings may be taken as the judge directs.

(2). Any conveyance under the seal of the County Court Judge shall be effectual to pass the estate or interest sold.

(3). The fees and costs in all proceedings taken under this section shall be such as are payable in respect of the like or similar matters according to the ordinary procedure of the said courts respectively. R. S. O. 1877, c. 120, s. 12.

Enforcing lien in High Court.

XXIX. In cases other than those specified in the preceding section the lien may be realized in the High Court, according to the ordinary procedure of that court. R. S. O. 1877, c. 120, s. 13.

Action by lien-holder to be for joint benefit.

XXX. (1) Any number of lien-holders may join in one action, and any action brought by a lien-holder shall be taken to be brought on behalf of all the lien-holders of the same class who shall have registered their liens before or within 30 days after the commencement of the action, or who shall within the said 30 days file in the proper office of the court from which the writ issued a statement entitled in or referring to the said action, of their respective claims.

Prosecution of claim when plaintiff dies, &c.

(2). In the event of the death of the plaintiff, or his refusal or neglect to proceed, any other lien-holder of the same class who has registered his lien or filed his claim in the manner and within the time above limited for that purpose, may be allowed to prosecute the action on such terms as may be deemed just and reasonable. 47 V. c. 18, s. 6.

Time when sale may be made.

(3). In case of a sale of the estate and interest charged with the lien, the court or judge may direct the sale to take place at any time after one month from the recovery of judgment, and it shall not be necessary to delay the sale for a longer period than is requisite to give a reasonable notice thereof.

The Court may order sale.

(4). The said court or judge may also direct the sale of any machinery and authorize its removal. R. S. O. 1877, c. 120, s. 14.

(5). Where judgment is given in favor of a lien, the court or judge may add to the judgment the costs of and incidental to registering the lien as well as the costs of the action. 45 V. c. 15, s. 14. Costs.

(6). Where there are several liens under this Act against the same property, each class of the lien-holders shall, subject to the provisions of sections 5, 9 and 11, rank *pari passu* for their several amounts, and the proceeds at any sale shall, subject as aforesaid, be distributed amongst them *pro rata*, according to their several classes and rights, and they shall respectively be entitled to execution for any balance due to them respectively after said distribution. R. S. O. 1877, c. 120, s. 17. Several liens.

(7). Upon application to the County Court, in claims under $200, and to the High Court in other cases, the court or judge may receive security or payment into court in lieu of the amount of the claim, and may thereupon vacate the registry of the lien. Security may be given in lieu of lien.

(8). The court or judge may annul the said registry upon any other ground. R. S. O. 1877, c. 120, s. 23. Registry may be annulled.

(9). In any of the said cases mentioned in sub-sections 7 and 8, the court or judge may proceed to hear and determine the matter of the said lien, and make such order as seems just, and in case the person claiming to be entitled to such lien has wrongfully refused to sign a discharge thereof, or without just cause claims a larger sum than is found by such court or judge to be due, the court or judge may order and adjudge him to pay costs to the other party. R. S. O. 1877, c. 120, s. 24; 47 V. c. 18, s. 7. Wrongful claim or refusal to discharge costs.

XXXI. Where any mechanic, artisan, machinist, builder, miner, contractor or other person, has furnished or procured materials for use in the construction, alteration or repair of any building, erection or mine, at the request of and for some other person, such materials shall not be subject to execution or other process, to enforce any debt (other than the purchase thereof) due by the person furnishing or procuring such materials, and whether the same have or have not been in whole or in part worked into or made part of such building or erection. R. S. O. 1877, c. 120, s. 25. When the materials used in the construction of buildings are not to be subject to executions.

XXXII. (1) Every mechanic or other person who has bestowed money or skill and materials upon any chattel or thing in the alteration and improvement in its properties or for the purpose of imparting an additional value to it so as thereby to be entitled to a lien upon such chattel or thing for the amount or value of the money or skill and materials bestowed, shall, while such lien exists but not afterwards, in case the amount to which he is entitled remains unpaid for three months after the same ought to have been paid, have the right in addition to all other remedies provided by law to sell the chattel or thing in respect of which the lien exists, on giving one week's notice by advertisement in a newspaper published in the municipality in which the work was done, or in case there is no newspaper published in such municipality, then in a newspaper published nearest thereto, stating the name of the person indebted, the amount of the debt, a description of the chattel or thing to be sold, the time and place of sale, and the name of the auctioneer, Mechanics entitled to lien on a chattle may sell the chattle if (after three months) payment is not made.

and leaving a like notice in writing at the last or known place of residence (if any) of the owner, if he be a resident of such municipality.

Application of proceeds of sale.

(2) Such mechanic or other person shall apply the proceeds of the sale in payment of the amount due to him and the costs of advertising and sale, and shall upon application pay over any surplus to the person entitled thereto. 41 V. c. 17, s. 3.

ERRATA.

Sec. XI, page 11, line 7, after the words "sections 5 and 9," insert the words "to a charge therefor *pro rata* upon any amount."

Sec. XVI (1), page 12, line 2, after words "in the registry" insert the words "office of the registry," etc.

Sec. XIX, last line, page 13, add "47 V, c. 18, s. s. 2-3."

NOTE.—Subsection 1 of section 30 of this act is amended; see section 39 of chapter 37 following.

AN ACT TO SIMPLIFY THE PROCEDURE FOR ENFORCING MECHANICS' LIENS.

(Assented to 7th April, 1890.)

HER Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows :—

Procedure for enforcing liens.

1. Any person claiming a mechanics' lien may enforce the same by means of the proceedings hereinafter set forth.

Statement of claim to be filed.

2. Without issuing a writ of summons or taking any other preliminary proceeding, the plaintiff may file a statement of claim in the office of a master or official referee having jurisdiction in the county wherein the lands in question are situate.

Affidavit verifying claim and certificate of filing.

3. Such statement of claim shall be verified by affidavit. Upon the filing of such statement of claim and affidavit, the master or referee shall issue a certificate in duplicate of the filing of the same.

Registration of certificate.

4. Upon the registration of such certificate in the proper registry office, or lands titles office, the action shall be deemed to have been commenced as against the owner and all other necessary parties to the action.

Certificate to name time and place for taking accounts.

5. The master or referee shall also, in and by such certificate, appoint a time and place at which he will inquire into the claim of the plaintiff and take all necessary accounts ; such certificate and appointment shall be issued in duplicate and may be in the form set forth in the schedule hereto.

Service of copy of certificate and appointment.

6. A copy of such certificate and appointment shall be served on the owner and all other proper parties at least ten days before the day therein named for taking the first proceeding thereunder.

Notice disputing claim.

7. Within ten days after the service of such certificate and appointment, any person served therewith may file a notice disputing the plaintiff's right to a lien.

Determination of the question raised by notice.

8. In case a notice disputing the plaintiff's lien is filed, the master or referee shall, before taking any further proceeding, determine the question raised by the notice, or may adjourn the question before a judge in chambers, and if so required by any parties may thereupon issue a certificate of his finding.

Entry of finding of master.

9. But if not required to issue such last named certificate, it shall suffice for the master or referee to enter in his book a note of his finding.

Where claim not disputed, owner to file statement of amount, if any, admitted to be due.

10. Where no notice disputing the plaintiff's lien is filed as atoresaid, and the proceedings are instituted by a sub-contractor, the owner is to file in the office of the master or referee a statement of account showing what, if anything, he admits to be due, for the satisfaction of the plaintiff's lien and all other liens of the same class as the plaintiff's. Such statement is to be filed at least four days before the day named in the certificate mentioned in section 5 for taking accounts, and in case the owner shall not file such statement, or shall file an untrue statement, he may be

ordered by the master or referee to pay all costs incurred in establishing the true amount due and owing from him.

11. All lienholders of the same class served with the appointment or who may claim to be entitled to the benefit of the action, shall also within four days named in the appointment for taking the accounts, or within such further time as the master or referee may allow, file in the office of the master or referee a statement of account showing the just and true sum due to them respectively, after giving credit for all sums in cash, merchandise, or otherwise, to which the debtor is entitled to credit on account of their respective claims, which accounts shall be verified by affidavit, and such accounts and affidavit may be in the form mentioned in the schedule hereto.

Other lien holders to file accounts.

12. A lien-holder who has not filed his claim within the time limited by the next preceding section may apply to the master or referee to be let in to prove his claim at any time before the amount realized by the proceedings for the satisfaction of liens has been distributed, and such application may be granted or refused, and upon such terms as to costs and otherwise as may appear just.

Lien holder not filing his claim may apply to be let in.

13. Upon the return of the appointment to take accounts, the master or referee shall proceed to take an account of what is due from the owner, and also what is due to the respective lienholders and incumbrancers who have filed their claims, and shall also tax to them respectively such costs as he may find them entitled to, and shall settle their priorities and shall make all other inquiries and take all other necessary accounts for the adjustment of the rights of the various parties, including therein where there is a prior mortgage or charge, and the holder thereof is a party to the proceedings, the amount by which it shall appear to the master or referee that the selling value of land has been increased by reason of the work or materials for which a lien is claimed on the land, and shall thereupon make a report of the result of such inquiries and accounts, and shall direct that the money found due by the owner shall be paid into court, to the credit of the action at the expiration of one month from the date of the report.

Master to take accounts, etc., and report.

14. In case any dispute arises as to the amount due from the owner for the satisfaction of the mechanics liens, or as to the amount claimed to be due, to any lien-holder or incumbrancer, the costs occasioned by the dispute shall be in the discretion of the master or referee and shall be borne and paid as he directs.

Costs to be in discretion of master.

15. If nothing is found due by the owner, the master or referee may make an order, staying all further proceedings, and make such order as to costs as shall be just, and at the expiration of fourteen days thereafter may grant a certificate, vacating the lien of the plaintiff and all other liens of the same class as the plaintiff's, unless the issue of the certificate shall in the meantime be stayed, and if such stay is granted, the certificate may issue forthwith after the removal of the stay, or so soon thereafter as the fourteen days shall expire.

Procedure where nothing found to be due from owner.

16. When anything is found due by the owner, he may on or

at any time before the day appointed for payment, pay the amount found due by him into court, and thereupon, upon proof of such payment, the master or referee may grant *ex parte*, a certificate in the form in the schedule vacating the liens of the plaintiff and all other liens of the same class as the plaintiff's.

Payment of amount found due into court.

17. The master or referee may make such order as to the owner's costs of obtaining and registering any certificate vacating a lien as may be just.

Owner's costs where lien vacated.

18. Upon the registration in the proper registry office or land titles office of a certificate vacating any lien or liens the same shall be thereupon vacated and discharged.

Registration of certificate vacating lien.

19. Upon payment into court of the amount which may be found due by owner the same shall (subject to the payment of any costs thereout as may be ordered) be paid out to the parties found entitled by the report of the master or referee.

Distribution of amount paid in by owner.

20. In default of payment by owner within the time directed by the report, the plaintiff may apply *ex parte*, to the said master or referee who, upon due proof of the default may issue a judgment for the sale of the land in question for the satisfaction of the lien of the plaintiff and other liens of the same class.

Judgment for sale of land on default of owner.

21. The judgment for sale may be in the form set forth in the schedule.

Form of judgment.

22. Such judgment for sale shall be entered as other judgments are required to be entered in the proper office for entering judgments in the county in which the judgment is made, and shall have the same force and effect as a judgment made at a trial of an action between the same parties.

Entry of judgment.

23. The sale under said judgment shall be conducted in the manner prescribed by the Consolidated Rules, respecting sales had under the order of the court.

Conduct of sale.

24. After the sale the master or referee shall make his report upon the sale, and shall tax the costs of the sale to the party entitled thereto, and shall in the same report apportion the money realized among the parties entitled thereto, and upon the confirmation of the report, the moneys realized may be paid out of court to the parties found entitled thereto by the report, without further order.

Master to make report on sale and tax costs.

25. For the purpose of the proceedings to obtain an order for sale and for carrying out the sale, and the apportionment of the moneys realized thereunder the plaintiff shall be deemed sufficiently to represent all other lien-holders entitled to the benefit of the action unless the court or master or referee otherwise orders.

Plaintiff to represent lien holders in proceedings for sale.

26. Any lien-holder entitled to the benefit of the action may apply for the carriage of the proceedings, and the master or referee may thereupon make such order, as to costs and otherwise as may be just, and any lien-holder who obtains the carriage of the proceedings shall in respect of all proceedings taken by him be deemed to be the plaintiff in the action.

Carriage of proceedings.

27. Any person affected by the proceedings may apply to the master or referee to dismiss the same for want of due prosecution and the master or referee may make such order upon the application as to costs or otherwise as may be just.

Dismissal of proceedings for want of prosecution.

28. Where any infants are named for defendants the appointment referred to in section 5 may be served upon the official guardian *ad litem* for such infants, who shall thereupon become and be the guardian *ad litem* for such infant in the proceedings; and it shall not be necessary to serve any such infant defendant with any further or other proceedings and such infant shall be bound thereby.

Official guardian to be served for infants.

29. Where the taxed cost of proceedings to enforce any mechanic's lien which are payable out of the amount realized by such proceedings for the satisfaction of the lien shall exceed 25 per cent. of the amount realized thereby for the satisfaction of the lien such costs shall be reduced proportionately by the master or referee so as the same shall not in the aggregate exceed the same 25 per cent. and no more costs than such reduced amount shall be recoverable between the party and party, or solicitor and client.

Costs not to exceed 25 per cent. of the amount realized.

30. After the amount of lien shall be realized any lien-holder who has proved a claim may apply to the said master or referee upon notice to his primary debtor for judgment for the payment of any balance which may remain due after deducting the amount received or payable in respect of the lien, and thereupon the master or referee may refuse the application upon such terms as to costs or otherwise as may be just or in case he sees fit to grant the application he shall grant a certificate of the amount, for which he finds the applicant is entitled to judgment for debt and costs.

Judgment for balance of the realizing amount of lien.

31. Such certificate may be filed in the proper office of the High Court for the entry of judgments if the amount awarded exceeds the sum of $400 and the same shall thereupon be entered in the judgment book, and shall thereupon become a judgment of the High Court and may be enforced in like manner as any other judgment for the payment of money is enforced in the High Court.

When judgment to be entered in High Court.

32. Where the amount awarded by the certificate is less than $400 but exceeds $100 such certificate may in like manner be entered in the County Court of the County in which the said proceedings are carried on and may be enforced in like manner as a judgment of such court.

And when in County Court.

33. Where the amount awarded does not exceed $100 the certificate may be entered with the clerk of the Division Court of the division in which the debtor resides in like manner, as a judgment of such court is entered and thereupon the same shall become and be, a judgment of such court and may be enforced in like manner as any other judgment of such Division Court.

And when in Division Court.

34. The fees payable for entering such certificate as a judgment shall be as follows:

Fees for entering certificates

In the High Court, $1.60
In the County Court .80
In the Division Court .50.

35. Orders and certificates made by a referee or master under the Act shall be appealable in like manner as orders made in Chambers by a local judge.

Appeals.

36. This Act shall not in any way affect, alter, or diminish the jurisdiction or proceedure of the County Courts or Division Courts for enforcing mechanics' liens in a summary manner, as provided by the 28th section of the Mechanics' Lien Act save in so far as sub-section 1 of section 30 of the said Act is hereby amended.

Act not to affect summary enforcement of mechanics' liens.

37. Where an action to enforce a mechanic's lien is brought and prosecuted in the High Court of Justice, otherwise than in the manner prescribed by this Act, no more costs shall be taxed or allowed to the plaintiff than would be incurred by proceeding in the manner prescribed by this Act unless the court or judge otherwise orders.

Costs where action improperly brought in High Court.

38. The proceedings under this Act shall be dee...ed to be an "action."

Proceeding under Act to be deemed an action.

39. Sub-section 1 of section 30 of the Mechanics' Lien Act is amended so as to read as follows :

Rev. Stat. c. 129, s. 30 (1) amended.

—30.—(1). Any number of lien-holders may join in one action or summary proceeding, and any action or summary proceeding brought by a lien-holder shall be taken to be brought on behalf of all the lienholders of the same class who shall have registered their liens before or within fourteen days after the commencement of the action, or who shall within the said fourteen days or within such further time as may be allowed for that purpose file in the proper office of the court where the pleadings are required to be filed (where the action has been commenced by writ) or in the office where the proceedings are being carried on (where they are being prosecuted in a summary manner) a statement entitled in, or referring to the said action of their respective claims.

Action by one of several lien holders to be for joint benefit.

40. This Act shall be read as part of the Mechanics' Lien Act subject to the provisions of this Act.

Act incorporated with Rev. Stat. c. 126.

NOTE.—The various forms of affidavits and notices, etc., are to be found in Chapter 37, p. 73, Statutes of Ontario, 53rd Victoria, 1890.

An Act to Consolidate the Acts Respecting Compensation to Workmen in Certain Cases.

[*55 V., c. 30.*] [*Assented to 14th April, 1892.*]

HER Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows :—

Short title.

1. This Act may be known and cited as "The Workman's Compensation for Injuries Act, 1892."

Interpretation.

2. Where the following words occur in this Act they shall be construed in the manner hereinafter mentioned, unless a contrary intention appears :

"Superintendence," meaning of.

(a) "Superintendence" shall be construed as meaning such general superintendence over workmen as is exercised by a foreman, or person in a like position to a foreman, whether the person exercising the superintendence is or is not ordinarily engaged in manual labour. 52 V., c. 23, s. 2 (3).

"Employer."

(b) "Employer" shall include a body of persons corporate or unincorporate, also the legal personal representatives of a deceased employer and the person liable to pay compensation under section 4 of this Act. R. S. O. 1887, c. 141, s. 2 (2), 52 V., c. 23, s. 2 (4).

"Workman."

(c) "Workman" does not include a domestic or menial servant, but, save as aforesaid, means any railway servant and any person who being a laborer, servant in husbandry, journeyman, artificer, handicraftsman, miner, or otherwise engaged in manual labour, whether under the age of twenty-one years, or above that age, has entered into or works under a contract, with an employer, whether the contract be made before or after the passing of this Act, be express or implied, oral or in writing and be a contract of service or a contract personally to execute any work or labour.

"Packing."

(d) "Packing" shall mean a packing of wood or metal or some equally substantial or solid material, of not less than two inches in thickness, and which, when filled in, shall extend to within one and a half inches of the crown of the rails in use on any railway, shall be neatly fitted so as to come against the web of such rails and shall be well and solidly fastened to the ties on which such rails are laid. R. S. O. 1887, c. 41, s. 2 (3-4).

"Railway Servant."

(e) "Railway servant" shall mean and include a railway servant, tramway servant and street railway servant. R. S. O. 1887, c. 141, s. 2, ; 52 V. c. 23, s. 2.

Where workman to have claim against employer.

3. Where personal injury is caused to a workman :

(a) By reason of any defect in the condition or arrangement of the ways, works, machinery, plant, buildings or premises, connected with, intended for, or used in the business of the employer : or

(b) By reason of the negligence of any person in the service of the employer, who has any superintendence entrusted to him whilst in the exercise of such superintendence : or

(c) By reason of the negligence of any person, in the service of the employer, to whose orders or directions the workman at

the time of the injury was bound to conform, and did conform, where such injury resulted from his having so conformed : or

(d) By reason of the act or omission of any person in the service of the employer, done or made in obedience to the by-laws of the employer or in obedience to particular instructions given by the employer, or by any person delegated with the authority of the employer in that behalf : or

(e) By reason of the negligence of any person in the service of the employer who has the charge or control of any points, signal, locomotive, engine, machine, or train upon a railway, tramway, or street railway.

The workman, or in case the injury results in death, the legal personal representatives of the workman and any persons entitled in case of death shall have the same right to compensation and remedies against the employer as if the workman had not been a workman of nor in the service of the employer, nor engaged in his work. R. S. O. 1887, c. 141, s. 3 ; 52 V. c. 23, ss. 3, 4, 5.

Employer, who to be deemed.

4. (1) Where the execution of any work is being carried into effect under any contract, and

(a) The person for whom the work or any part thereof, is done, owns, or supplies any ways, works, machinery, plant, buildings, or premises used for the purpose of executing the work, and :

(b) By reason of any defect in the condition or arrangements of such ways, works, machinery, plant, buildings or premises, personal injury is caused to any workman, employed by the contractor or by any sub-contractor : or

(c) The defect, or failure to discover the defect or remedy the defect arose from the negligence of the person for whom the work or any part thereof is being done, or of some person being in his service and entrusted by him with the duty, of seeing, that such condition or management is proper :

The person for whom the work or that part of the work is done shall be liable to pay compensation for the injury as if the workman had been employed by him, and for that purpose shall be deemed to be the employer of the workman, within the meaning of this Act. Provided, always, that any such contractor or sub-contractor shall be liable to pay compensation for the injury as if this section had not been enacted, so however that double compensation shall not be recoverable for the same injury.

(2) Nothing in this section contained shall affect any rights or liabilities of the person for whom the work is done and the contractor and sub-contractor (if any) as between themselves. 52 V. c. 23, s. 6.

Injuries by railways.

5. Where within this province personal injury is caused to a workman employed on or about any railway :

(a) By reason of the lower beams or members of the superstructure of any highway or other overhead bridge, or any other erection or structure over said railway not being of sufficient height from the surface of the rails to admit of an open and clear headway of at least seven feet between the top of the

highest freight cars then running on such railway and the bottom of such lower beams or members : or

(b) By reason of the space between the rails in any railway frog, extending from the point of such frog backward to where the heads of such rails are not less than five inches apart, not being filled in with packing : or

(c) By reason of the space between any wing rail and any railway frog and between any guard rail and any other rail fixed and used alongside thereof as aforesaid and between all wing rails where no other rail intervenes (save only when the space between the heads of any such wing rail and railway frog as aforesaid, or between the heads of any such guard rail and any other rail fixed and used alongside thereof as aforesaid, or between the heads of any such wing rails where no other rail intervenes as aforesaid is either less than one and three-quarters of an inch or more than five inches in width) not being at all times during the month of April, May, June, July, August, September, and October, filled in with packing.

Such injury shall be deemed and taken to have been caused by reason of a defect within the meaning of sub-section 1 of section 3 of this Act. But nothing in this section contained shall be taken or construed, as in any respect or for any purpose restricting the meaning of said sub-section. R. S. O. 1887, c. 141, s. 4.

Exceptions to preceding provisions.

6. A workman shall not be entitled under this Act to any right of compensation or remedy against the employer in any of the following cases, that is to say

(a) Under sub-section 1 of section 3, unless the defect therein mentioned arose from or had not been discovered or remedied owing to the negligence of the employer or of some person entrusted by him with the duty, of seeing that the condition or arrangement of ways, works, machinery, plant, buildings or premises are proper. R. S. O. 1887, c. 141, s. 5, (1) ; 52 V. c. 23 s. 8.

(b) Under sub-section 4 of section 3, unless the injury resulted from impropriety or defect in the rules, by-laws, or instructions therein mentioned ; provided, that where a rule or by-law has been approved or has been accepted as a proper rule or by-law either by the Lieutenant Governor in Council or under and pursuant to any provision in that behalf of any Act, of the Legislature of Ontario or of the Parliament of Canada it shall not be deemed for the purposes of this Act to be an improper or defective rule or by-law. R. S. O. 1887, c. 141, s. 5, (2).

(c) In any case where the workman knew of the defect or negligence which caused his injury or failed without reasonable excuse to give or cause to be given, within a reasonable time information to the employer or some person superior to himself in the service of the employer, unless he was aware that the employer, or such superior already knew of the said defect or negligence. Provided however that such workman shall not by reason only, of his continuing in the employment of the employer with knowledge of the defect, negligence, act, or omission, which caused his injury, be deemed to have voluntarily incurred the

risk of the injury. R. S. O. 1887, c. 141, s. 5, (3) 52 V. c. 23, s. s. 7, 9.

Limit of amount of compensation.

7. The amount of compensation recoverable under this Act, shall not exceed either such sum as may be found to be equivalent to the estimated earnings during the three years preceeding the injury of a person in the same grade employed during those years in the like employment, within this Province, or the sum of fifteen hundred dollars, whichever is larger: and such compensation shall not be subject to any deduction, or abatement, by reason, or on account, or in respect of any matter or thing whatsoever, save such as is specially provided for in section 12 of this Act. R. S. O. 1887, c. 141, s. 6; 52 V. c. 23, s. 10.

Distribution of compensation.

8. When in any action under this Act compensation is awarded in the case of the death of a workman, for an injury sustained by him in the course of his employment, the amount recovered after deducting the costs, not recovered from the defendant may, if the Court or Judge before whom the action is tried so directs, be divided between the wife, husband, parent, and child of the deceased in such shares as the Court or Judge with or without assessors, as the case may be, or, if the action is tried by a jury, as the jury may determine. 52 V. c. 23, s. 14.

Limit of time for recovery of compensation.

9. An action for the recovery under this Act of Compensation for an injury shall not be maintainable against the employer of the workman, unless notice that injury has been sustained is given within twelve weeks and the action is commenced within six months from the occurrence of the accident causing the injury, or in case of death, within twelve months from the time of death; provided always that in case of death the want of such notice shall be no bar to the maintainance of such action if the Judge shall be of opinion that there was reasonable excuse for such want of notice. R. S. O. 1887, c. 141, s. 7; 52 V. c. 23, s. 11.

Contract by workman when to constitute a defence to action for compensation.

10. No contract or agreement made or entered into by a workman shall be a bar or constitute any defence to an action for the recovery under this Act, of compensation for any injury.

(a) Unless for such workman entering into or making such contract or agreement, there was other consideration than that of his being taken into or continued in the employment of the defendant; nor

(b) Unless such other consideration was in the opinion of the Court or Judge before whom such action is tried ample and adequate; nor

(c) Unless in the opinion of the Court or Judge, such contract or agreement, in view of such other consideration was not on the part of the workman, improvident, but was just and reasonable; And the burthen of proof in respect of such other consideration and of same being ample and adequate, as aforesaid, and that the contract was just and reasonable, and was not improvident as aforesaid, shall, in all cases rest upon the defendant; provided always that notwithstanding anything in this section contained, no contract or agreement whatsoever made, or entered into by a workman shall be a bar or constitute any defence to an action

for recovery under this Act, of compensation for any injury happening, or caused by reason of any of the matters mentioned in section 5 of this Act. R. S. O. 1887, c. 141, s. 8.

Liability of personal representative.

11. Notwithstanding anything contained in this Act, an action under sections 3, 4 or 5 shall lie against the legal representatives of the deceased employer. 52 V. c. 23, s. 15.

Money payable under penalty to be deducted from compensation.

12. There shall be deducted from any compensation awarded to any workman, or representatives of any workman, or persons claiming by, under or through a workman in respect of any cause of action arising under this Act, any penalty or damages or part of a penalty or damages, which may in pursuance of any other Act, either of the Parliament of Canada, or the Legislature of Ontario, have been paid to such workman, representatives or persons in respect of the same cause of action; and where an action has been brought under this Act by any workman or the representatives of any workman or any persons claiming by, under or through, such workman, for compensation in respect of any cause of action arising under this Act, and payment has not previously been made of any penalty or damages or part of a penalty or damages, under any such Act either of the said Parliament, or of the said Legislature, in respect of the same cause of action such workman, representatives or persons shall not so far as the said Legislature has power to enact, be entitled thereafter to receive in respect of the same cause of action any such penalty or damages or part of a penalty or damages under any such last mentioned Act. R. S. O. 1887, c. 141, s. 9.

Form and service of notice of injury.

13. *(a)*. Notice in respect of an injury under this Act shall give the name and address of the person injured and shall state in ordinary language the cause of the injury, and the date at which it was sustained and shall be served on the employer, or if there is more than one employer, upon one of such employers.

(b) The notice may be served by delivering the same to or at the residence or place of business of the person on whom it is to be served.

(c) The notice may be served by post, by a registered letter addressed to the person on whom it is to be served at his last known place of residence or place of business and if served by post shall be deemed to have been served at the time when a letter containing the same would be delivered in the ordinary course of post, and in proving the service of such notice it shall be sufficient to prove that such notice was properly addressed and registered.

(d) Where the employer is a body of persons corporate or unincorporate the notice shall be served by delivering the same at or by sending it by post, in a registered letter addressed to the office or if there be more than one office, any one of the offices of such body. R. S. O. 1887, c. 141, s. 10. (1-4).

(e) The want of sufficiency of the notice required by this section or by section 9 of this Act shall not be a bar to the maintainance of an action for the recovery of compensation for the injury if the Court or Judge before whom such action is tried or in case of appeal, if the Court hearing the appeal is of opinion

that there was reasonable excuse for the want or insufficiency and that the defendant has not been thereby prejudiced in his defence. 52 V. c. 23, s. 12.

(f) A notice under this section shall be deemed sufficient if in the form or to the effect following :—

To A. B. of (*here insert employer's address*) or To the———— ————Company (*or as the case may be*).

Take notice that on the day 189 C. D. of (*insert address of injured person*) a workman in your employ sustained personal injury (*add*, of which he died, *if such be the case*), and that such injury was caused by (*state shortly the cause of injury e. g.* the fall of a beam).

Date. Yours, etc.,

X. Y.

R. S. O. 1887, c. 141, s. 10. (6).

Defence of want of notice.

14. If the defendant in any action against an employer for compensation for an injury sustained by a workman in the course of his employment intends to rely for a defence on the want of notice or the insufficiency of notice or on the ground that he was not the employer of the workman injured, he shall, not less than seven days before the hearing of the action or such other time as may be fixed by the rules, regulating the practice of the Court in which the action is brought, give notice to the plaintiff of his intention to rely on that defence, and the Court may in its discretion and upon such terms and conditions as may be just in that behalf, order and allow an adjournment of the case for the purpose of enabling such notice to be given ; and subject to any such terms and conditions any notice given pursuant to and in compliance with the order in that behalf shall, as to any such action and for all purposes thereof be held to be a notice given pursuant to and in conformity with sections 9 and 13 of this Act. 52 V. c. 23, s. 13.

Particulars of demand.

15. In an action brought under this Act, the particulars of demand or statement of claim shall state in ordinary language the cause of the injury and the date at which it was sustained, and the amount of compensation claimed ; and where the action is brought by more than one plaintiff the amount of compensation claimed by each plaintiff, and where the injury of which the plaintiff complains shall have arisen by reason of the negligence, act, or omission of any person in the service of the defendant, the particulars shall give the name and description of such person. R. S. O. 1887, c. 141, s. 11.

Appointment of Assessors.

16. *(a)*. Upon the trial for the recovery of compensation under this Act before a Judge without a jury, one or more assessors may be appointed by the Court or Judge for the purpose of ascertaining the amount of compensation and the remuneration (if any) to be paid to such assessors shall be fixed and determined by the Judge at the trial.

(b). Any person who shall as hereinafter provided, be appointed to act as an assessor, shall be qualified so to act.

(c) In such action a party who desires assessors to be appointed, shall, ten clear days at least before the day for holding

the Court, at which the action is to be tried, file an application stating the number of assessors he proposes to be appointed, and the names, addresses, and of the persons who may have expressed their willingness in writing to act as assessors. If the applicant has obtained the consent of the other party, to the persons named being appointed, he shall file such consent with his application.

(*d*) Where the application for the appointment of assessors has been made by one party to the action only, he shall, eight clear days before the day for holding the Court at which the action is to be tried, serve a copy of the application so filed upon the other party who may then either file an application for assessors or file objections to one or more of the persons proposed.

(*e*) An application for the appointment of assessors may be in the form following, or to the like effect, namely :—

In the (*describing the Court*)
"The Workman's Compensation for Injuries Act 1892"
Between————————Plaintiff
————————Defendant.

The plaintiff (*or* defendant) applies to have an assessor (*or* assessors) appointed to assist the Court in ascertaining the amount of compensation to be awarded to the plaintiff, should the judgment be in his favour, and he submits the names of the following persons, who have expressed their willingness in writing to act as assessors should they be appointed.

(*Here set out the names, addresses and occupations of the persons above referred to*). (*If the party consents to the appointment add the following :—*

The defendant (*or* plaintiff) consents to the appointment of any of the persons, above named to act as assessors, in this action, as appears by his consent thereto filed herewith.

Dated this———day of————————189—

A. B.

The above named plaintiff (*as the case may be*).

(*f*) Where separate applications are filed by the parties, no objections to the persons proposed shall be made by either party, but the Court or Judge may appoint from the persons named in each application one or more assessor or assessors, provided that the same number of assessors be appointed from the names given in such applications respectively.

(*g*) In such action brought in a Division Court, the application for the appointment of assessors, together with any objections made to the persons proposed, shall be forwarded by the Clerk of the Court to the Judge.

(*h*) Where application for the appointment of assessors is granted the Court or Judge shall appoint such of the persons proposed for assessors as by the Court or Judge may be deemed fit, subject to the provisions contained in this Act.

(*i*) In such action where an application for the appointment of assessors has been filed the Court or Judge may, at any time prior to the trial thereof nominate one or more additional persons to act as assessors in the action. Where no application for

assessors has been made, the Court or Judge may appoint one or more persons to act as assessor or assessors in the action before, or on the trial of the action.

(*j*) If at the time and place appointed for the trial, all or any of the assessors appointed shall not attend, the Court or Judge may either proceed to try the action with the assistance of such of the assessors, if any, as shall attend or may adjourn the trial generally, or upon any terms which the Court or Judge may think fit, or may appoint any person who may be available and who is willing to act, and who is not objected to or who, if objected to, is objected to on some insufficient ground or the Court or Judge may try the action without assessors.

(*k*) Every person requiring the Court or Judge to be assisted by assessors shall at the time of filing his application, deposit therewith the sum of $4 for every assessor proposed, and such payments shall be considered as costs in the action, unless otherwise ordered by the Court or Judge: Provided that where a person proposed as an assessor, shall have in writing agreed and consented that he will not require his remuneration to be deposited, no deposit in respect of such person shall be required.

(*l*) Where an action shall be tried by a Court or Judge with the assistance of assessors in addition to or independently of any assessors proposed by the parties, the remuneration of such assessors shall be borne by the parties, or either of them as the Judge or Court shall direct.

(*m*) If after an assessor has been appointed the action shall not be tried, the Court or Judge shall have power to make an allowance to him in respect of any expense or trouble that he may have incurred by reason of his appointment, and direct the payment to be made out of any sum deposited for his remuneration.

(*n*) The assessors shall sit with and assist the Court or Judge when required with their opinion and special knowledge for the purpose of ascertaining the amount of compensation if any, which the plaintiff shall be entitled to recover. R. S. O. 1887, c. 141, s. 12.

Consolidation of actions.

17. (*a*) Where several actions shall be brought under this Act, against a defendant, in the same court in respect of the same negligence, act, or omission, the defendant shall be at liberty to apply to the Judge that the said actions shall be consolidated.

(*b*) Applications for consolidation of actions shall be made upon notice to the plaintiffs affected by such consolidation.

(*c*) In case several actions shall be brought under this Act, against a defendant in the same court in respect of the same negligence, act, or omission, the defendant may upon filing an undertaking to be bound so far as his liability for such negligence, act or omission by the decision in such one of the said actions as may be selected by the Court or Judge, apply to the Court or Judge for an order to stay the proceedings in the actions other than in the one so selected, until judgment is given in such selected action.

(*d*) Applications for stay of proceedings shall be made upon notice to the plaintiffs affected by the stay of proceedings or *ex parte*.

(*e*) Upon the hearing of an application for consolidation of actions or for stay of proceedings, the Court or Judge shall have power to impose such terms and conditions and make such order in the matter as may be just.

(*f*) If an order shall be made by a Court or Judge, upon an *ex parte* application to stay proceedings, it shall be competent to the plaintiffs affected by the order to apply to the Court, or Judge (as the case may be) upon notice or *ex parte* to vary or discharge the order so made, and upon such last mentioned application such order shall be made as the Court or Judge shall think fit, and the Court or Judge shall have power to dispose of the costs, occasioned by such order as may be deemed right.

(*g*) In case a verdict in the selected action shall be given, against the defendant, the plaintiffs in the actions stayed, shall be at liberty to proceed for the purpose of ascertaining and recovering their damages and costs.

(*h*) A defendant may by notice to the opposite party to be given or served at least six days before the day appointed for the trial of the action, admit the truth of any statement of his liability for any alleged negligence, act, or omission as set forth or contained in the plaintiff's statement or particulars of claim in the action, and after such notice given the plaintiff shall not be allowed any expense thereafter incurred for the purpose of proving the matter so admitted.

(*i*) Where two or more persons are joined as plaintiffs under sub-section 1 of this section and the negligence, act, or omission, which is the cause of action shall be proved, the judgment shall be for all the plaintiffs but the amount of compensation, if any, that each plaintiff is entitled to, shall be separately found and set forth in the judgment and the amount of costs awarded in the action shall be ordered to be paid to such person, and in such manner as the Court or Judge may think fit; should the defendant fail to pay the several amounts of compensation and the costs awarded in the action execution may issue as in an ordinary action and should the proceeds of the execution be insufficient after deducting all costs, to pay the whole of the amounts awarded a dividend shall be paid to each plaintiff calculated upon the proportion of the amount, which shall have been awarded to the respective plaintiffs to the total amount realized after the deduction of all costs of the action as aforesaid. R. S. O. c. 141, s. 13.

Computation of time.

18. Where the time for doing any act, taking any proceeding, or giving any notice under or required by this Act, expires on a Sunday, such act, or proceeding or notice shall so far as regards the time of doing, taking or giving the same, be held to be duly and sufficiently done taken or given, on the day next following such Sunday. R. S. O. 1887, c. 141, s. 14.

Forms and rules.

19. In an action brought in any Court to recover compensation under this Act, the forms and methods and rules, and orders in force in Court shall, subject to and save as otherwise provided by the terms and provisions of this Act, apply to and regulate all matters of pleading, practice and procedure in such action, and notwithstanding anything in this Act contained, the forms

and method, pleadings, practice and procedure in any such action shall conform to, and be regulated by any rules or orders in that behalf hereafter lawfully and duly made or prescribed with respect to actions brought in any such Court. R. S. O. 1887, c. 141, s. 15.

Saving clause.

20. All Acts and parts of Acts consistent with this Act, are hereby repealed: but such repeal shall not affect, nor shall any provision of this Act prejudice anything heretofore done or suffered, or any right heretofore acquired or accrued under or in pursuance of said Acts or parts of Acts so repealed and any proceeding in respect of any such right, and any action, suit, or proceeding under or in pursuance of said last mentioned Acts or parts of Acts, shall be instituted, continued, completed and determined and dealt with in all respects, and for all purposes as if this Act had not been passed. R. S. O. 1887, c. 141, s. 16; 52 V. c. 23, s. 16.

No. 3075. A BY-LAW RESPECTING THE CONSTRUCTION OF BUILDING SCAFFOLDINGS.

[*Passed June 6th, 1892.*]

The Municipal Council of the Corporation of the City of Toronto enacts as follows:

I. All scaffoldings used by bricklayers or other builders in the erection, repairing, altering or improving of buildings, chimneys or other structures, shall be built and constructed as follows:

BUILDERS' SCAFFOLD.

Standards or uprights to be of live, sound Norway pine, tamarac or spruce (tamarac preferred). Distance between each standard eight or ten feet, and butts of said standard placed in the ground to the depth of not less than two feet six inches, and when placed upon stone flagging or granolithic sidewalk, to be put in a good sound cement or other barrel or a box two feet square by two feet six inches high, and filled with sand or other suitable material. The standards to be not less than four and a half inches at butt, and two and a half inches at the top diameter, and in a very high scaffold, to be increased in size.

Ledgers same material as standards, not less than three inches diameter at small end, and no ledger to be taken off the standards that would allow a greater distance from the ground than ten feet. Putlogs to be of ironwood, white oak, or other suitable material, the said putlogs to be butted, flattened or squared at the end which enters the wall, and not to be removed according as the scaffold rises. One course of planking, the entire length of scaffold, must remain on each tier of the said putlogs. The putlogs not to be less than three and a half inches in diameter clear of bark. Three putlogs to be placed under planks twelve feet in length, that is to say, one putlog at each end, and one in centre. (When planks sixteen feet long are used five putlogs shall be used.) Planks to be two inches in thickness, and of sound pine, spruce or hemlock, ten or twelve inches in width.

Scaffolds to be stayed from ledgers on to the joists through the openings, and in the absence of openings, to be stayed by other sufficient means.

Racking braces to consist of poles, and tied with ropes. Ropes not to be less than sixteen feet in length, and five-eighths of an inch thick, except in case of small scaffolds, when rope one-half inch thick may be used.

Ladders in all cases to reach five feet above the landing stage, so that plenty of hold will be afforded men when landing off.

When bricks are laid from the inside of fire-proof buildings, there shall be a temporary floor of two-inch plank laid on the girders or temporary joists all around the inside of walls and not less than six feet wide, and when bricks are laid from the inside of buildings not fire-proof, which have joists not over fourteen inches apart, then the temporary floor may be of one-inch boards six feet wide and placed all around the building.

In all cases where the inside scaffolding is built from the foundation the same as the outside scaffolding, the temporary floors above mentioned shall not be required.

When trestles are used the height to be from four to six feet and to be made substantial, of good material; and when a scaffold is formed by putting trestles

one upon another, it shall not be over eighteen feet in height, that is to say, not more than three trestles shall be used of the height of six feet each.

Where required all overhead protections to be placed fully under scaffolds. When building out to the street line, boards or planks to be placed where the workmen pass under.

II. All scaffolding used by carpenters, in the erection, repairing, altering or improving of buildings, chimneys or other structures, shall be built and constructed as follows:

CARPENTERS' SCAFFOLDING.

1. All uprights of said scaffolding to be 4 × 4, sound and free from objectionable knots, the brackets nailed to them and to the building, and to be one inch in thickness, and not less than ten inches wide, properly nailed to building and upright; and when there is no opening to nail said bracket, then a piece one inch thick and six inches wide to be notched to secure the bracket, and nailed solid to the wall and to the upright. The boards laid on this to walk on to be two-inch plank, sound and free from knots, or else two one-inch boards laid on on top of the other.

2. When bracket scaffold is put up, the leg to be sound and not less than 2 × 6 on edge, set at the proper angle, to prevent the bracket from tipping from the wall.

3. When scaffolding projects from windows, the scaffold to be one inch thick by not less than ten inches wide, and braced on the angle with a board not less than one inch thick and six inches deep, both brace and bracket well nailed to window, and the brace well nailed to bracket also.

III. The City Commissioner shall prosecute all persons who may proceed with the erection of buildings using scaffolding which is not constructed in accordance with this By-law, and in the event of the City Commissioner finding a scaffold which in his estimation is unsafe, and after due notice to the contractor the same is not made satisfactory, the said Commissioner may take such proceedings against him as he has power under this or any other By-law.

IV. Any person convicted of a breach of any of the provisions of this By-law shall forfeit and pay at the discretion of the convicting magistrate a penalty not exceeding the sum of fifty dollars for each offence, exclusive of costs, and in default of payment of the said penalty and costs forthwith, the said penalty and costs, or costs only, may be levied by distress and sale of the goods and chattels of the offender, and in case of there being no distress found out of which such penalty can be levied, the convicting magistrate may commit the offender to the Common Gaol of the City of Toronto, with or without hard labor, for any period not exceeding six calendar months, unless the said penalty and costs be sooner paid.

No. 3082. A BY-LAW TO AMEND BY-LAW No. 3075 RESPECTING THE CONSTRUCTION OF BUILDING SCAFFOLDING.

[*Passed July 7th, 1892.*]

The Municipal Council of the Corporation of the City of Toronto enacts as follows:

I. Section 3 of By-law No. 3075 is hereby amended by striking out all the words in the section after the word "By-law" in the third line thereof.

MONTREAL BY-LAW CONCERNING SCAFFOLDS.

BY-LAW No. 107, Sec. 51.

All scaffolds erected for use in the erection or repair of any building shall be well and safely supported and of sufficient strength and size and properly secured so as to insure the safety of persons working thereon or passing under the same, against the falling thereof or of such materials as may be used or deposited thereon; any scaffold which may be otherwise erected shall be deemed a nuisance; and any person who shall erect or use, or cause to be erected or used, any scaffold contrary to the provisions hereof shall be liable to the penalty provided in section 103 of this By-law.

Section 103 provides that for each offence against any by-law the offender "shall be liable to a fine, and in default of immediate payment of said fine and costs to an imprisonment, the amount of said fine and the term of said imprisonment to be fixed by the Recorder's Court at its discretion."

GLOSSARY OF TERMS USED IN BUILDING.

Aisle (pronounced ile)—a passageway between seats; the space between the outside walls and the columns in a cathedral church.
Alcove—a recess in the side of a room.
Alto relievo—carving projecting considerably above the surface; also "high relief,"
Ambo—same as pulpit.
Anchor—a term applied to ties and fastenings.
Andirons (or fire dogs)—irons for the support of fuel in open fire places.
Angle bead—a small round moulding secured to outside angles of walls.
Angle brace—a bracket or framing in the angle of two surfaces.
Angle staff—see angle bead.
Annex—a building subordinate to a main building.
Antique—referring to ancient style.
Apse—semi circular end of a room or chancel.
Arabesque—ornamentation of flat surfaces.
Arc—a geometrical term used for a portion of a circle.
Arcade—(1) a series of arches and columns.
(2) a corridor.
Arch—a construction of bricks or other materials so arranged as by mutual pressure to support each other and to become capable of sustaining a superincumbent weight.
Archivolt—same as soffit.
Area—a space, a court yard or sunken court.
Arris—the line or edge formed by the meeting of two plain surfaces.
Ashlar—cut or hewn stone used in the face of a wall, generally with vertical and horizontal joints.
Astragal—semi circular moulding or bead.
Attic—a sub-story rising above the cornice of a building.
Auditorium—a hall for assemblies.

Back arch—a relieving arch.
Ball cock—a water cock in the form of a ball, placed inside a cistern to regulate the inflow of water.
Balderchino—a canopy supported on columns over an altar, tomb or throne.
Ball flower—a gothic ornament like a ball enclosed in three leaves.
Balloon frame—Rough framing of a wooden building.
Baluster—perpendicular standard supporting a rail, also banister.
Balustrade—a range of balusters with upper and lower rail.
Barge Board—board used as a finish on the face of a gable, plain or ornamental.
Barrel drain—a brick conduit built in cylindrical form.
Barrel vault—a long semi circular vault or roof.
Base—lower part of a wall or pillar.
Bas relief or basso relievo—carvings raised but little above the surface; also "low relief."
Bat—a broken brick.
Batten—a thin strip of wood.
Batter—the sloping face of a wall built wider at the bottom than at the top.
Battlement—indentations in the top of a parapet wall.
Bay—a division in the architectural arrangement of a wall.
Bay window—a window forming a recess in a room.
Bead—a small circular moulding.

Bead and butt—a panel moulded with a bead, abutting against a square surface; also "bead and flush."
Bead and quirk—a bead sunk below the surface with the angles of the surface cut off.
Beamfilling—building round the ends of beams or joists in a wall.
Bearer—a strut or post or horizontal piece supporting a shelf or other boards.
Bearing wall or partition—portion of a wall or partition that carries a superstructure.
Bed moulding—strictly speaking a moulding immediately under the cornice of a classic building.
Belvedere—a high turret.
Bevel—a sloping surface.
Billet—a block of wood.
Binder—same as "Header."
Binding joist—same as "Trimmer."
Block plan—a plan showing the outline of a building.
Blocking course—a plain course of stone above a cornice, its face being in the same plane as the face of the walls below.
Bond—in brick or stone work denotes arrangement of headers and stretchers.
Bond, English—in brickwork a course of headers and a course of stretchers laid alternately.
Bond, Flemish—in brickwork, headers and stretchers laid alternately in the same course.
Bond stone—same as "Header."
Bond timber—pieces of wood built into a wall on which to secure the other woodwork.
Bow Window—a semi circular bay window.
Box frame—the frame of a window made hollow for the sash weights.
Box girder—a hollow built girder.
Brace—a stiffening piece in framing.
Breaking joint—a term applied to the joints of masonry or other work which are not continuous.
Breast of a chimney—the projecting portion of a chimney stack in a room.
Breast of a window—that portion of a wall below the window.
Bressummer—a heavy beam.
Brick nogging—brickwork laid in the interstices of framing.
Bridging—pieces of wood secured between joists for the stiffening of floors.
Broach—the masonry at the foot of an octagonal spire above the square tower.
Bull's nose—a rounded angle.
Bush hammered—the worked face of a stone formed by a bush hammer. This hammer is formed of several metal points with which the stone is pounded.
Butting joint—the junction of two pieces cut at right angles with the surface.

Cable moulding—a moulding like a rope.
Cant—the surface left when the angle of a square is cut off.
Cantilever—a bracket.
Cap or capital—the highest member of a column.
Carriage of a stair—the rough timbers supporting a staircase; also "stringers."
Case—see box frame. *Casing*—boxing in of pipes, etc.
Casement—(1) a sash hinged like a door.
(2) also a classic moulding (see "Scotia").
Cauking or caulking—filling of joints.
Cavetto—a hollow moulding.
Centre—rough framework for the support of an arch in construction.

Centre of gravity—that point at which all the weight of a mass might be collected without disturbing the equilibrium of the body.
Chace—a groove.
Chace mortise—a mortice cut so as to admit of a transverse piece of timber being let in between two parallel pieces.
Chamfer—like a bevel, the cutting off of a right angle to an angle of 45°.
Chancel—the choir of a church containing an altar.
Cheeks of a mortice—the two solid pieces on each side of a mortice.
Chevron—a zig-zag moulding of the Norman style.
Chiseled work—Stone work finished with a chisel.
Choir—part of the chancel of a church.
Chord—a line joining the extremities of an arch.
Cima recta— Greek undulating moulding.
Cima reversa—like a cima recta reversed.
Cinque foil—a Gothic ornament of five semi circular curves with four cusps or points at the junctions of the curves.
Circumference—the outside line of a circular body.
Clamp—a piece of metal or other material by which two stones or other substances are fastened together.
Clapboard—thin boarding covering framework of a building.
Clearstorey—the upper portion of a church wall above the aisle roof.
Cleat—a small piece of wood secured to timbers for the support of other woodwork.
Cloister—a covered and paved walk in connection with a cathedral.
Closer—a portion of a brick less than the width of a header inserted as a header near the end of a course.
Cofferdam—timber framing employed in bridge building, sunk into the water.
Coin or quoin—blocks of stone finishing the angles of a building.
Collar beam—a horizontal beam in roof construction secured to the rafters midway between the eaves and ridge.
Column—a perpendicular pillar.
Common rafter—ordinary rafters of a roof.
Concave—a hollowed surface.
Convex—an outward curved surface.
Cope stone—see coping.
Coping—cap stones of a wall.
Corbie steps—steps up a gable.
Corbel table—a row of corbels or ornamental brackets.
Counter sinking—any cutting below the general surface.
Crowning—forcing up the centre of a joist by drawing in the ends with a screw rod.
Cusps—the points of intersection of curves in Gothic architecture.

Dado—lower portion of a wall faced with panelling or other decoration.
Dais—a raised portion of a floor or low platform.
Deafening—any method of construction for the purpose of deadening sound.
Deflection—a term applied to the bending of a beam from a straight line under pressure.
Dentil—an ornament of square blocks.
Diaper work—decoration of a flat surface, generally carved or sunk, sometimes painted.
Discharging arch, or relieving arch—an arch formed over a lintel to relieve it of the superincumbent weight.

Dog legged stairs—a stair case divided into two flights, the outer string of the upper flight being directly over the handrail of the lower.
Dog tooth moulding—a moulding peculiar to Early English architecture.
Door jamb—the lining on the ingoing of a door.
Dormer—a window in a sloping roof.
Dormitory—a large sleeping room.
Dovetail—a wedge shaped joint for woodwork.
Dowel—a wooden or metal pin.
Dragon piece—a short piece of timber used to strengthen the foot of a principal rafter or to tie together the intersecting eaves-plates at the angles of a building.
Dressings—the finished stonework of windows, doors, etc.
Drips—the formation at changes of levels in flat or sloping roofs.
Drip stone or moulding—a projecting moulding to throw off the water over a window or doorway, called also "Labels."
Dry rot—a disease of vegetable growth that attacks timber in damp situations.
Droved ashlar, margins, etc.—a tooled margin on stone; also *draved.*

Eaves—edges of a roof.
Echinus—egg and anchor moulding.
Elliptic arch—arch in the form of an ellipse.
Embrasure—(1) the splay or bevel of a door or window jamb: (2) a cutting in a thick wall.
Engaged column—a column attached to a wall.
English bond—see Bond.
Entasis—the swelling or curved vertical line of a shaft or column.
Entresol—an intermediate storey, called also "Mezzanine."
Equilateral arch—a pointed gothic arch, the height of the apex above the spring being equal to the width of the span at the spring.
Escutcheon—a key hole plate; also "scutcheon."
Extrados—the upper surface of an arch.
Eye of a volute—the central spot of a spiral curve.

Facade—principal or front elevation of a building.
Facing—the outer surface of a wall, etc.
Fanlight—a transom light.
Fan tracery—radiating ornament, the decoration applied to *Fan vaulting*, a feature of the perpendicular style.
Fenestration—the spacing of windows in a wall.
Fillet—a small band or square member in mouldings.
Finial—the finish or vertical ornament of a turret, roof or spire.
Flags—paving stones
Flashings—metal coverings round the edges of gutters, etc., on roofs or against brickwork.
Flemish bond—see Bond.
Floating—a term in plastering, the finishing work.
Flush—a term indicating the meeting of two surfaces on the same plane.
Flutes or Flutings—semi-circular sinkings on flat surfaces.
Flying buttress—an arched buttress.
Foils—the curves between the cusps in gothic architecture.
Footings—the lowest courses of foundations.
Formeret—the principal rafter against a wall at the end of a building.
Free stone—sand stone.

Freize—(1) in classic architecture that part of an entabalature between the architrave and cornice ; (2) the upper portion of a wall in a room, usually so called for decorative purposes.
Fresco painting—painting on flat surfaces of a particular character.
Fret—an ornament of classic art.
Furrings—woodwork beneath the plastering, fastened against the walls or on the underside of joists, etc., to receive the lathing.

Gable—the pointed upper part of a wall.
Girt—surface of a moulding.
Grill—open screen work in any material.
Groin—the line of intersection of the vaults in vaulted ceilings.
Grounds—strips of wood forming the projections to which to fasten finished woodwork.
Grout—liquid mortar or cement.
Gurgoyle or Gargoyle—ornamental spout generally of stone in gothic architecture to conduct rain water from the roofs or gutters.

Half space—a platform on a staircase.
Half-timbered work—16th century domestic architecture in which framing timbers appear on the surface forming panels usually filled with brick nogging.
Hammer beam—the lower beam projecting horizontally into a building (a hall or church) acting as a base and tie at the foot of a principal rafter.
Hammer dressed—Method of finishing stone surfaces with a hammer, leaving the face rough and broken.
Hanging stile—the uprights to which doors or casements are hinged.
Hasp—a fastening of metal to secure doors.
Hatchway—an opening in a roof or floor.
Header—a brick or stone acting as a bond between the face and back work of a wall.
Heptagon—a geometrical figure of seven sides.
Herring bone, strutting or bridging—cross pieces of wood secured between joists for stiffening floors. (see Bridging).
Herring bone masonry—masonry in which the stones are laid diagonally.
Hexagon—a six-sided figure.
High relief—(see Alto relievo.)
Hip—the line formed by the angle of two meeting roofs.
Hip rafter—the rafter at the intersection of two roof slopes.
Hip roof—a roof constructed of equally inclined planes rising to the same pitch and height.
Hood-mould—(see Drip.)

Impost—head of a pier.
Inverted arch—an arch constructed with the apex downwards, used chiefly in foundations.
Intrados—soffit of an arch or dome.
Isle, ile—(see Aisle.)

Jack rafter—(same as Dragon piece.)
Jamb—sides of an opening.
Joggle—a notched joint in wood or stone work.

Key—a wedge of wood for tightening up joints.
Key stone—the apex stone of an arch.

King post—the central post in roof framing hanging from the apex to the principal rafters and supporting the tie beam.
Knotting—preparing the knots in woodwork with shellac for painting.

Label—see Dripstone.
Lancet arch—an early English arch of lancet form.
Lattice girder—a metal girder of lattice work.
Lintel—a beam or stone spanning an opening.
Low relief—see Bas relief.
Louvre boards—horizontal boards placed sloping outwards, forming unglazed apertures, such as belfries or ventilators in brewery roofs, etc.

Mansard roof—a roof, the incline of which is in two planes, the lower very steep and the upper one of a slight rise only. The lower is often used and finished as an attic storey. It derives its name from its inventor, Francis Mansard, a French architect, born 1598.
Marquetry or Parquetry—inlaid work of different woods.
Metope—In Doric architecture, the square space between the triglyphs.
Mortise—a hollow cavity in woodwork into which is let a tenon of another piece to form a joint.
Mullion—a vertical division between the lights of a window or opening in a screen.

Narthex—the vestibule of a church.
Nave—(1) the body of a church ; (2) the centre passage between the seats in a church.
Needle—a horizontal timber used as a support.
Newel—main posts in a railing, principally in a staircase.
Niche—a recess for a statue.
Nogging—see Brick nogging.
Nonagon—a nine-sided figure.
Nosing—projecting moulding of a step or horizontal board.

Obelisk—a quadrangular shaft of stone set on end, the diameter of which is less near the summit than at the base ; the summit is truncated.
Octagon—an eight-sided figure.
Ogee—a mould of double curve.
Oriel window—a projecting window in an upper floor.

Panel—a raised or sunk portion in a general surface surrounded by mouldings.
Pantile—a curved roof tile.
Parallelogram—a four-sided rectangular figure.
Parapet—a low wall above the eaves of a building.
Parquetry—inlaid work of wood.
Party wall—a wall the centre line of which is over the dividing line of two properties or lots of ground. The owner of each lot has certain rights in connection with its use.
Patera—a circular, flat ornament.
Pedestal—a base.
Pediment—a gable or triangular portion above the cornice of a classic building.
Pendentive—hanging work of stone, timber or any other material.
Penehammer—in masonry, a tool for pounding the inequalities on a flat surface.
Pentagon—a five-sided figure.
Piend check—the rebate formed on the bottom of a riser.
Pile—a timber driven into the earth to make a foundation in loose ground.
Pinnacle—the finial of a buttress.

Plate—a piece of timber laid horizontally on a wall to form a bed for the ends of other timbers.
Plinth—the projecting sub-base of a base.
Plugs—small pieces of wood driven into walls to fasten woodwork to the wall.
Pointing—the act of filling the face of joints of brick or stone with mortar.
Poleplate—a purlin at the foot of the principals in a roof on which to rest the common rafters.
Principal—the framed main supports of a roof.
Pugging—deafening with clay.
Purlin—a horizontal piece of timber in roof construction for the support of common rafters. It gets its support from the principals.
Putlogs—short timbers in scaffolds at right angles to the walls.

Quarters—scantlings of timbers in partitions or other framing.
Quarter pace—the quarter landing of a staircase.
Quatre foil—a gothic ornament of four semi-circular curves with three points or cusps at the junctions of the curves.
Queen posts—the two suspended posts of a principal roof truss, supporting the tie beam, acting like a king post but used for larger spans.
Quirk— a curved sinking. See Bead and Quirk.

Rabbet or rebate—a rectangular cutting along the edge of a piece of wood or other material.
Rebate joint—a joint formed by a rebate.
Radius—in geometry, a line drawn from the centre to the circumference of a circle.
Rafter—the timbers of a roof laid from the eaves to the ridge.
Raking piece—a piece of wood on a slope.
Ramp—the sudden rise in a handrail or wall or other substance.
Random work, random rubble—masonry with irregular courses or jointings.
Relieving arch—same as Discharging arch.
Rendering—a plastering coat.
Reredos—a screen or ornamental wall behind and above an altar.
Responds—half piers or buttresses.
Retaining wall—a wall built to support an embankment of earth.
Reveal—the ingoing or recess at right angles to the face of a wall.
Ridge piece—the horizontal board against which the upper end of the rafters abut.
Riser—the vertical part of a step.
Rockfaced work—stonework left rough on the face.
Roll and fillet—a bead having a square projection on its face.
Rolled beams—iron or steel beams rolled between rollers not cast.
Rood screen—a screen at the junction of a chancel with a nave.
Rose window—a circular window.
Rough cast—rough plastering on the exterior of a wall made by throwing small pebbles against the finished coat of plaster.
Rough string—the rough carriage of a stair.

Saddle—a thin piece of wood bevelled on two edges placed on the floor beneath a door.
Sagging—the bending of a body by its own weight, the ends being supported.
Sash—the glazed part of a window, also sash frame.
Sash lock or fastener—a metal fastening for a window.
Scantling—small timbers.
Scarf—method of joining timbers lengthwise.

Scotia—a hollow moulding.
Screed—in plastering, a strip of wood the exact thickness of the coat of plaster, nailed for the plasterers to work to.
Scribing—fitting pieces of wood together.
Segment—part of a circle.
Set off—a break in the face of a wall, etc.
Setting coat—the last coat in plastering.
Skewback—the inclined abutment of an arch.
Skirtings—base boards of a room.
Sleepers—timbers laid on the ground to receive the joists of a floor.
Soffit—underside of doorway, staircase, etc.
Span—the opening beneath an arch or lintel.
Spandrel—the triangular space over the haunch of an arch.
Specific gravity—the weight of any body as compared with the same magnitude of rainwater, a cubic foot of which weighs 1000 oz.
Sphere—a circular body, a ball.
Springer—the top of an impost.
Stile—the upright portions of a door or window sash.
Stilted arch—an arch that has its centre struck from a point above the impost cap, the curves of the arch being carried down vertically to the impost cap.
Strap—a narrow iron band used to hold timbers together.
Stretcher—a stone or brick with its long side to the face of a wall.
String course—a projecting horizontal band of stone plain or moulded.
Struck joint—a finish given to a mortar or cement joint in brick work or masonry.
Tail joist—joist framed between the tail trimmer and the wall, also trimming joist.
Tail trimmer or trimmer—the beam or double joist to carry the hearth laid parallel with the face of chimney breast.
Tangent—a line that touches in part of its length the circumference of a circle.
Templet—a pattern.
Tenon—a tongue of wood to fit the mortise.
Tension rod—a rod of metal used to counteract a thrust.
Throat—(1) of a chimney, the narrowing above the fireplace ; (2) the groove cut under the projecting part of a sill to prevent the water running into the joint.
Tie beam—the horizontal main timber of a roof, etc., tying the ends of the principal rafters.
Torus—half-round moulding.
Tracery—(1) ornamental masonry or woodwork of windows ; (2) raised decorations of flat surfaces.
Transept—the "arms" of a church.
Transom—a bar across a window or head of a door with a fanlight over.
Tread—the horizontal portion of a step.
Trefoil—a gothic figure of three semi connected circles.
Triforium—in cathedrals the arcade above the nave arches and below the clear story.
Trimmer—see Tail trimmer, etc.
Truss—a framing of timber to support a weight.
Trussed girder—a beam strengthened by trussing.
Tuck pointing—filling joints in masonry or brickwork and forming a raised joint.
Tympanum—the triangular space in the front of a pediment between the horizontal and sloping cornices.

Underpinning—rebuilding the lower portion of a wall without pulling down the upper part.

Valley—a junction of two inclines of a roof.
Valley board—board forming a valley.
Vane—a finial of a roof.
Vault—(1) an arched roof of masonry or brickwork ; (2) a compartment securely built for the storing of valuable articles.
Veneer—a thin layer of any material covering a coarser material.
Volute—spiral curves on a flat surface.
Voussoir—keystone and other radiating stones of an arch.

Wainscoi—a base or dado.
Wall plate—a narrow timber laid on the top course of the face of a wall to receive the eaves boards, etc.
Winders—triangular steps of a staircase at a corner or bend in the flight.
Weepers or weeping drain pipes—a drain laid with unjointed pipes for the purpose of dispersing surface water.

NOTES ON ESTIMATING.

Cubic measure is length, breadth and height or depth multiplied together.
Superficial or square measure is the multiplying together of the two dimensions of a surface.
Lineal, running or run measure is measurement in one length.

[*See Tables.*]

Excavating.

Take excavating to surface 12 in. deep per sq. yard.
Take excavating (ordinary) per cubic yard.
Excavating over 6 ft. deep should be kept separate, and allowance made for staging if required.
Trenches for foundations if below general excavating, take extra at per. cubic yard.
Allow for width of trenches 6 in. on each side of lowest course of footings.
Allow for casting away, or removal in other ways as specified, or for part filled in and rammed.
In rock foundations extra time must be allowed.
Strutting and planking when required per line-foot.
Allow extra cost for strutting and planking over 6 ft. deep.
Clay puddling, per cubic yard.
Concrete, per cubic yard.
Allow for wheeling or carting.
Levelling and consolidating ground, per cubic yard,
Post holes, at so much each, counted.
Drains, keep different sizes separate, and include cement jointing, etc., per lineal foot.
Junctions, bends, Y's, T's, etc., count as 1 foot lin'l of pipe, except special ones.
Cement, per barrel.
Sand, per load.
" River or other special quality, per barrel.
Mortar, per load.
Concrete, 6 in. thick, per sup. yard.
Concrete, over 6 in. thick, per cubic yard.

Masonry.

Stonework is generally measured by the toise.
A toise varies in different localities as for instance:

A toise in Montreal	=	86	Cubic	feet.
" " " Toronto	=	54	"	"
" " " Hamilton	=	70	"	"
" " " Perth Ont.	=	36	"	"

Take masonry, generally per toise.
Allow for hoisting, adding an extra price for every 20 ft. over the first 40 ft. of height.
Ashlar, or other face work, per sup'l ft.
Backing, except very thick walls, per cubic ft. or toise.
Door and window openings to be taken as solid, to allow for labor and cutting.
Cut Stone, per superficial ft.
Each kind of stone to be kept separate, and each kind of work on each as specified.
Allow for different treatment, as hammer-dressed, bush hammered, grooved, throated, sunk, chamfered, etc., etc.
Cut stone must be measured to suit courses of brick work.
Treads and risers, per superficial ft.
String courses, per superficial ft.
All stone under 3 in. *thick*, per sup'l ft.
Chamfers, beads, margins, etc., per lin'l ft.
Mitres, stopped ends, stop chamfers, counted.
Landings, pavings, etc., per superficial ft.
Nosings, and other edge work, per lineal ft.
Rebated joints, etc., per lineal ft.
Pointing as specified, per lineal ft.
Allow for templates
" " hoardings,
" " scaffolding where required.

Rubble masonry when built in courses requires *per cubic yard* about 35 cubic feet of stone, *including waste*, and 6½ cubic feet of mortar.
Random and uncoursed rubble 33 cubic feet of stone and 9 cubic feet of mortar
1 cubic yard ashlar requires, including waste, 29¾ cubic feet of stone and 2¾ cubic feet of mortar.
1 lineal yard pointing to ashlar work requires from one-twentieth to one-thirtieth of a cubic foot of mortar or cement.

Brickwork.

Sizes of bricks vary in different places, but usually,—

For face work allow 7 bricks per sq. foot.
" solid " " 20 " " cub. ft.
" " " 546 " " cub. yd.

1 Cub. yd. of brickwork requires about 5 cub. ft. of mortar.

1 Rod of brickwork = 272 sup. ft. of 1½ brickwork.

Take brickwork by cubic feet, and count per thousand.

Face work by sup'l feet, and count per thousand.

Make no deductions for flues less than 2 feet square, or for cavities in hollow walls.

Take doorways and windows as solid, except where there are many, in which case deduct half.

Circular brickwork over 25 ft. radius, measure first as ordinary brickwork, and then measure one face and allow for that amount extra labor.

Brickwork built fair, both sides to be kept separate.

Backing to stone work, per cub. yard.

Allow for cutting to fit against stone, measure foctings, averaging them by adding together lengths of top and bottom courses and dividing by 2.

Moulded bricks, per lin'l foot, and per 1,000.

Brick on edge, per sq. yard.

Brick nogging, measuring over woodwork, per sq. yard.

Brick nogging requires ¾ cub. ft. mortar when flat.

Brick nogging requires ½ cub. ft. of mortar when on edge.

Pointing, per sq. yard.
" requires if flat ⅛ cub. ft. lime mortar, or ⅛ bushel cement.
" requires if tuck, ⅛ cub. ft. putty or ⅛ cub. ft. mortar.

Slate Mason.

Slate slats, per superficial foot.

Allow for bedding in cement, or screwing with copper screws, as specified,

Slate skirtings, per lineal foot.

Rounded edges, rebates, grooves, etc. etc., per lineal foot.

Rounded corners, perforations for pipes, sinkings, holes for basins, etc. etc., counted.

Carpenter and Joiner

One square = 100 superficial feet.

Rough timbers, as joists, beams, studding, roof timbers, rafters, etc., per cubic feet.

Care must be taken in calculating the correct number of joists required.

Timbers under 3 in. square, per lineal foot.

Timbers under 2 in square, per sup. ft.

Keep separate the various sizes of timbers; flooring, roof boarding, shingling, etc. per square.

Allow for waste in cutting, 25 per cent.

Eaves boards, gutter boards, flashing boards, barge boards, bracketting, facias and the bearers to these, per sup. ft.

In framed work allow for length of tenon.

Allow for laps to plates, etc., 6 in. in every 20 feet.

Take bolts, straps, plates, etc., to principals.

Ribs, chamfers, mouldings, rebates, strutting or bridging to floors, eaves and valley fillets, hip and ridge rolls, etc., per lin'l ft.

Note:—In drawings the actual length of hip rafters rarely appears. They must be set off to scale before figuring.

Ends of rafters, hip knobs, cleats, scarfings, counted.

For scarfings where they are not resting on a principal, allow four times the depth of the beam to every 20 ft. run extra.

Keep different kinds of work separate, and all circular work separate.

Skirtings, mitred boards to hearths, grounds, nosings, architraves, wall strings, and outer strings of stairs, hand, and other rails, cornices, mouldings, door frames, etc. etc., per lineal foot.

Window sashes, casements, and frames, shutters, and boxings, window boards, and bearers, panelling, dados, doors, jamb linings, w.c. fittings, bath fittings, treads, nosers, and winders, seats, shelving, and bearers, and ceiling lights, casings, etc., per sup. foot.

Newels, mitrings, housings, fitted ends and bosses, pendants, etc. etc., counted.

Mantles, arcades, over-doorways, require to be figured in detail.

Allow for attending on other trades and making good after them.

Allow for clearing up waste and rubbish, and removing shavings from between joists, before laying flooring.

Allow for additional scaffolding as required.

Roofer.

Felt and gravel or other similar roofing material, per square of 100 feet.

Allow for lapping of felt and laying double at edges, also for wood strips for securing.

Slater.

Slates, including nailing, per square of 100 ft.

Allow for cuttings against dormers, chimneys, skylights, hips, valleys, etc.

Take double course at eaves, valleys and other edges.

Slate hips, ridges, etc., per lineal foot.

Felt, if required, per square.

Allowances for laps, etc., as in roofer.

Galvanized Iron.

For flat or inclined roofs, per square.
Allow about 6 in. extra for each drip, raised joint, etc.
Gutters, allowing for turning up under slate say 9 in. on each side, and for laps 4 in. in every 7 ft., per sup. foot.
Flashings allow 4" in every 7 ft.
" step " "
" cap " " per lineal ft.
Ridges, hips and valleys and allowance for laps as above, per lineal foot.
Oak wedging for flashings.
Copper nailing as specified, per lineal foot.
Rainwater pipes, eaves, gutters, etc., per lineal foot.
Returned ends, stopped ends, outlets, heads, knees, feet, junctions with drains, cleats, etc., counted.

Plasterer.

Keep separate internal and external work.
Materials required for plastering per yard super :

Brown coat only ⅜" thick	lime (unslaked)	.15 cubic ft.
	sand	.3 "
	hair	.1 lb.
	water	1.2 gallon.
Brown, and finish coat ½" thick	lime (unslaked)	.22 cubic ft.
	sand	.23 "
	hair	.12 lb.
	water	1.8 gallon.
2 coats ⅝" thick	lime (unslaked)	.25 cubic ft.
	sand	.38 "
	hair	.18 lb.
	water	2.00 gallon.
3 coats ¾" thick	lime (unslaked)	.32 cubic ft.
	sand	.38 "
	hair	.18 lb.
	water	2.6 gallon.
Finish with putty and plaster ⅛" thick	lime (unslacked)	.10 cub. ft.
	plaster of Paris	.03 "
	water	1.00 gallon.

For rubble or rough brick walls the above quantities should be increased.
The first or "pricking up" coat on laths requires about 1-10th more coarse stuff than "rendering only," or brown coat only.
Laths, containing nominally 400 feet lineal will cover about 4⅛ super yards.
Nails—a bundle of 3-ft. laths takes 500 nails.
" 4-ft. " 470 nails.
Hair—a bushel of dry hair weighs from 14 to 15 lbs.
In best work allow 1 lb. of hair to 2 cubic feet of mortar.
Ordinary work, 1 lb. hair to 3 cubic feet of mortar.
Lime whiting once done requires 1 cubic foot slaked lime per 100 sq. yards; twice done, 1⅔ cub. ft. of lime.
Take plastering (generally) to walls, partitions, ceilings, soffits of stairs, etc., two or three coat work as specified, and lathing as described, per sup. yard.
Small quantities, per sup. foot.
Cornices under 12 in. girth, per lineal foot.
Cornices over 12 in. girth, per sup. foot.
Cornices, if bracketted, allow for lathing.
Enriched mouldings, per lineal foot.
Ornaments, bosses, etc., counted.
Mitres, stopped and returned ends, counted.
Moulded ribs, strings, straight or forming panels, per lineal foot.

NOTE.—Laths — In specifying lathing the terms "lath," "lath and a half," "double lath," refer to the thickness of the laths.

single laths = ⅛ in. to 3-16 in. tnick.
lath and a half = ¼ in thick.
double laths = ⅜ in. thick.

Plumber and Gasfitter.

Lead in sinks, cisterns, etc., per sup. foot.
In measuring lead care should be taken to measure exactly, as small errors become serious when quantity is reduced to weight.
Copper nailing, soldered angles, per lineal foot.
Iron cisterns, giving capacity, counted.
Slate cisterns, per sup. foot.
Allow for all drillings for pipes, balls and ball cocks, wastes, closet valves, ball levers, etc.
Pipes, tin cased, lead, iron, of all kinds, per lineal foot.
Gas tubing, per lineal foot.
Allow for joints soldered or screwed, wiped, caulked; bends, faucets, offsets, valves, elbows, T's, Y's, straps, etc.
Brackets and pendants a sum is generally mentioned.
Allow for burners, glass shades, etc.
Lavatory, urinal w. c. bath fittings all according to description.
Ascertain if joiner is to attend on plumber and do all cutting and making good after.
Pumps and fixtures described and counted.
Allow for special requirements for each kind.

Tiler.

Plain tiling, per square.
Allowances as for slate.
Hips, ridges, etc., per lineal foot.
Finials, etc., counted.

Hardware.

According to specification, counted.

Iron Founder.

Keep separate wrought and cast iron, also the different articles.
Heavy work per cubic foot, and calculate weight in tons at so much a lb. as specified.
Allow for hoisting and fixing, cartage, extra scaffolding, etc.
Ascertain what assistance is specified to be given by other trades.
For vaults get special prices.
Allow for patterns for all castings.
Allow for drilling, bolting and all other work to be done after placing in position.
Rivetted girders, fish-plates, pavement lights, coal plates and frames, per sup. foot.
Gratings, bars, rails, straps, bolts not already taken by carpenter, saddle bars, guard bars, balusters, gates, railings, hand rails, etc., per lineal foot.
Iron roof principals, rafters, purlins, with all shoes, cleats, brackets, ties, T irons, etc., take in detail and keep separate.
Holes, perforations, etc., counted.
For girders, etc., consult price lists of iron founders.

Glazier

Keep different kinds of glass separate.
Measure all glass in inches and turn into superficial feet, measuring to extreme dimensions.
Allow for sprigging, puttying, or bedding in washleather or india rubber as required.
Embossing, enamelling post lights, per sup. foot.
Lead lights, per sup. foot.
Bevelling, per lineal foot.
Plate glass, the price of, is apt to vary ; price lists should always be obtained from importers.
Allow for cleaning at completion and for breakages.

Painting.

Keep separate different classes of work.
1 lb. white paint mixed with oil, etc , will cover on *wood* about 4½ sup. yards, first coat ; second coat same quantity will cover about 6½ sup. yards, and each additional coat about 6¼ sup. yards.
1 lb. red lead paint mixed and applied as a first coat on *iron*, about 5¼ sup. yards.
1 lb. oxide of iron paint mixed and applied as a first coat on iron, from 8 to 12 sup. yards.
1 gallon tar with 1 lb. pitch included, applied hot, will cover about 12 sup. yards first coat on wood and 17 sup. yards each additional coat.
1 lb. of putty for stopping is required for every 20 to 25 yards of surface.
Take painting (generally) per sup. foot.
Allow for knotting, stopping, etc.
Ascertain if priming is included when two, three or four coat work is specified.
Allow extra when work is finished in two or more colors.
Count windows and double them for painting both sides.
Oiling, rubbing, staining, sizing, varnishing, French polishing, graining, etc., per sup. foot.
Railings, gates, gratings, measure round of bars.
Measure round of bars, open framing, etc.
Skirtings, cornices, strings, etc., per lineal ft.

Paper Hanging.

Generally, per sup. foot.
Allow for waste.
To find the number of pieces (12 yards) required for a wall, take the superficial area deducting doors and windows and divide by 54. This rule applies to an average width of 20 inches to the piece.
Allow for filling cracks in old walls.
Measure borders, per lineal yard.

Bell Hanger.

Specification should state positions of bells and pulls.
Bells and pulls, counted,
Allow for fixing with all cranks, wire, springs, plates.
Zinc or copper tubing, per lineal foot.
Ascertain if various trades are to do cutting required in their own work.
For electric bells and fittings get special prices from engineers.
Pneumatic bells, get special prices from engineers.
Speaking tubes, per lineal foot.
Allow for mouthpieces and all fixing as required.

Electric Lighting.

Get special estimates from engineers.

Heating Apparatus.

Get special estimates from manufacturers.

NOTES ON HOSPITAL WARDS—MINIMUM DIMENSIONS.

Space between beds	7 ft. 6 in.
Superficial area per bed	90 sq. ft.
Height of ward	14 ft.
Cubic space per bed	1260 cub. ft.
Width of ward	24 ft.
No. of beds to a ward (not more than)	32.

[*Galton.*]

WEIGHT OF SUBSTANCES PER CUBIC FOOT.

	Average Weight in lbs.
Aluminium	162
Ash, American white, dry	38
Asphaltum	87
Brass, (copper and zinc) cast	504
" rolled	524
Brick, best pressed	150
" common, hard	125
" soft, inferior	100
Brickwork, pressed brick	140
" ordinary	112
Cement, ordinary	56
" English, Portland	90
Cherry, dry	42
Chestnut, dry	41
Coal, broken, loose	49
" solid	84
Coke, loose	62
Copper, cast	542
" rolled	548
Earth, dry, loose	76
" " " moderately rammed	95
Elm, dry	35
Gold, cast, pure, 24 carat	1204
Granite	170
Hemlock, dry	25
Hickory, "	53
Ice	58.7
Iron, cast	450
" wrought, purest	485
" " average	480
Lead	711
Lime, quick ground, loose	53
" " " " thoroughly shaken	75
Limestones and marbles	168
" " " loose in irregular fragments	96
Maple, dry	49
Mahogany, Spanish, dry	53
" Honduras dry	35
Masonry, granite, or limestone, (well dressed)	165
Masonry, mortar, rubble	154
" dry rubble	138
" sandstone well dressed	144
Mortar, hardened	103
Mud, dry, close	80 to 110
Mud, wet fluid, maximum	120
Oak, live, dry	59
" white, dry	59
" other kinds	32 to 45
Pine, white, dry	25
" yellow, (Northern)	34
" " (Southern)	45
Salt, Liverpool, fine for table use	49
Sand, of pure quartz dry loose,	90 to 106
Sand, well shaken	99 to 117
" perfectly wet	120 to 140
Sandstone, fit for building	151
Slate	175
Snow, freshly fallen	5 to 12
Snow, moistened and compact by rain	15 to 20
Spruce, dry	25
Steel	490
Sulphur	125
Tar	62
Tin, cast	459
Turf or peat, dry unpressed	20 to 30
Walnut, dry, (black)	38
Water, pure rain or distilled, at 60° Fahr.	62½
Water, Sea	64
Zinc, or spelter	43.7
Green wood, add from one fifth to one half more than dry	

APPROXIMATE BREAKING STRENGTHS OF WIRE IN TONS, PER SQUARE INCH.

Annealed iron wire,.....25 tons per square inch, tensile resistance.
Bright iron wire,.....35 " " " " " "
Bessemer steel wire,.....40 " " " " " "
Mild Siemens steel, wire....60 " " " " " "
Crucible cast steel wire.....80 to 90. " " " "
Patent plough crucible wire..100 to 120 " " " "

VARIOUS TABLES

TABLE OF CUBES.

Cube of 1 is	1		Cube of	7 is	343
" 2 "	8		"	8 "	512
" 3 "	27		"	9 "	729
" 4 "	64		"	10 "	1000
" 5 "	125		"	11 "	1331
" 6 "	216		"	12 "	1728

ALGEBRAIC FORMULAE.

1. $(a+b)(a+b)=a^2+2ab+b^2$.
2. $(a+b)(a-b)=a^2-b^2$.
3. $(x+a)(x+b)=x^2+xa+bx+ab$.
4. $(a+b)(a^2+ab+b^2)=a^3+b^3$.
5. $(a-b)(a^2+ab+b^2)=a^3-b^3$.
6. $(a+b)^3=a^3+b^3+3a\,b+3ab^2$.
7. $(a-b)^3=a^3-b^3-3a^2b-3ab^2$.
8. $\frac{x^2+xy+y^2}{x-y}=x^3-y^3$.
9. $\frac{x^2+xy+y_2}{x+y}=x^3+y^3$.
10. $(a+b+c)(a+b+c)=a^2+b^2+c^2+2ab+2ac+2bc$.

FORCE AND VELOCITY OF WIND, AND ITS PRESSUREUPON ROOFS, SPIRES, ETC.

VELOCITY.			FORCE OR PRESSURE PER FT. SUP.	DESCRIPTION
MILES PER HOUR	FEET PER MINUTE	FEET PER SECOND		
1	88	1.47	.005	Barely perceivable.
2	176	2.93	.02	Just perceivable.
3	264	4.4	.044	
4	352	5.87	.079	Light breeze.
5	440	7.33	.123	
10	880	14.67	.492	Pleasant breeze.
15	1320	22.0	1.107	
20	1760	29.3	1.97	Brisk gale.
25	2200	36.6	3.067	
30	2640	44.0	4.429	High wind.
35	3080	51.3	6.027	
40	3520	58.6	7.87	Very high wind.
45	3960	66.0	9.9	
50	4400	73.3	12.304	Storm.
60	5280	88.0	17.733	Great storm.
70	6160	102.7	24.153	
80	7040	117.3	31.49	Hurricane.
100	8800	146.6	49.21	

Weights of Materials.

The weight of wrought iron **X** 0·928 = cast iron.
" " 0·928 = zinc.
" " 1·010 = steel.
" " 1·082 = brass.
" " 1·144 = copper.
" " 1·468 = lead.

The Weight of Wrought-iron Bolt Heads, Nuts and Washers.

Diam. of Bolt.	Hexagon H'ds & Nuts.	S'qre. Heads and Nuts.	Round Washers.	Diam. of Bolt.	Hexagon H'ds & Nuts.	Sq're Heads and Nuts.	Round Washers.
inches.	per pair.	per pair.	per pair	inches.	per pair.	per pair:	per pair.
¼	20 to a lb.	16 to a lb.	20 to a lb.	1⅜	3·00	3·60	3·25
⅜	10 "	8⅓ "	10 "	1½	3·75	4·42	4·25
½	5 "	4⅙ "	5 "	1⅝	4·75	5·70	5·25
⅝	2¾ "	2½ "	3 "	1¾	5·75	7·00	6·50
¾	2 "	·56 lb.	·63 lb.	1⅞	7·27	8·72	8 00
⅞	·77 lb.	·83	·77	2	8·75	10·50	9·60
1	1 25	1·31	1.25	2½	17·00	21·00	19·00
1⅛	1·75	2·10	1·75	3	28·80	36·40	32·50
1¼	2·13	2·56	2·25				

Round and Square Iron—Weight of a Lineal Foot.

Diam. or Side in inches.	Round in lbs.	Square in lbs.	Diam. or Side in inches.	Round in lbs.	Square in lbs.	Diam. or Side in inches.	Round in lbs.	Square in lbs.	Diam. or Side in inches.	Round in lbs.	Square in lbs.
⅛	·041	·053	1½	5·952	7.578	3⅝	34·761	44.258	5¾	87·459	111·356
¼	·165	·210	1⅝	6·985	8·894	3¾	37·199	47·363	5⅞	91·303	116·251
5-16	·258	·329	1¾	8·101	10·315	3⅞	39·720	50·573	6	95.230	121·250
⅜	·372	·474	1⅞	9·300	11·841	4	42·324	53·889	6¼	103·331	131·565
7-16	·506	·645				4⅛	45·011	57.310			
			2	10·581	13·472				6½	111·763	142·300
½	·661	·842	2⅛	11·945	15·209	4¼	47·780	60 835	6¾	120·525	153·457
9-16	·837	1·066	2¼	13·392	17·051	4⅜	50·632	64·467	7	129·618	165·035
⅝	1·033	1·316	2⅜	14·921	18·998	4½	53·567	68.203	7½	148·796	189·453
11-16	1·250	1·592	2½	16·533	21·050	4⅝	56·584	72·045	8	169·297	215·556
¾	1·488	1·895	2⅝	18·228	23·208	4¾	59·684	75·992	8½	191·121	243·352
13-16	1·746	2·223	2¾	20·205	25.471	4⅞	62·867	80·044	9	214·267	272·812
⅞	2·025	2·579	2⅞	21·865	27·839	5	66·132	84·201	9½	238.736	303·967
15-16	2·325	2·960				5⅛	69·480	88·464			
			3	23·807	30.312				10	264·527	336·806
1	2·645	3·368	3⅛	25·833	32·891	5¼	72·910	92·832	10½	291·641	371·328
1⅛	3·346	4·263	3¼	27·941	35·575	5⅜	76·424	97·305	11	320·078	407·535
1¼	4·133	5·263	3⅜	30·131	38·364	5½	80·019	101·884	11½	349·837	445·425
1⅜	5·001	6·368	3½	32.405	41·259	5⅝	83.698	106·567	12	380·919	485·000

Round, Octagonal, and Square Steel—The Weight of a Lineal Foot.

Diameter of Circle and Oct. and Side of Square.	Round in lbs.	Octagonal in lbs.	Square in lbs.	Diameter of Circle and Oct. and Side of Square.	Round in lbs.	Octagonal in lbs.	Square in lbs.
1/8	·0417	·0440	·0532	1	2·673	2·819	3·403
3-16	·0940	·0991	·1196	1 1/8	3·382	3·568	4·307
1/4	·1670	·1762	·2127	1 1/4	4·176	4·405	5·317
5-16	·2610	·2753	·3323	1 3/8	5·053	5·330	6·433
3/8	·3758	·3964	·4785	1 1/2	6·013	6.343	7·656
7-16	·5115	·5396	·6513	1 5/8	7·057	7·444	8·985
1/2	·6681	·7047	·8507	1 3/4	8·185	8·633	10·421
9-16	·8456	·8919	1·077	1 7/8	9·396	9·910	11·963
5/8	1·044	1·101	1·329	2	10·690	11·276	13·611
11-16	1·263	1 332	1·608	2 1/4	13·530	14·271	17·227
3/4	1·503	1·586	1 914	2 1/2	16·703	17·618	21·267
13-16	1 764	1·861	2·246	2 3/4	20·211	21·318	25.734
7/8	2·046	2·158	2·605	3	24·053	25·371	30·625
15-16	2·349	2·478	2·99				

Note.—The diameter of Octagon Steel is measured across the sides.

Flat Steel.—The Weight of a Lineal Foot.

Width in inches.	Thickness in inches.							
	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1/8	·0532	·1063	·1595	·2127	·2658	·3190	·3722	·4253
1/2	·2127	·4253	·6380	·8507	1·063	1·276	1·489	1·701
5/8	·2658	·5317	·7975	1·063	1·329	1·395	1·861	2·127
3/4	·3190	·6380	·9570	1·276	1·595	1·914	2 233	2·552
7/8	·3722	·7443	1·117	1·489	1·861	2·233	2·605	2 977
1	·4253	·8507	1·276	1·701	2·127	2·552	2·976	3·403
1 1/8	·4785	·9570	1·436	1·914	2 393	2·871	3·350	3·828
1 1/4	·5317	1·063	1 595	2·127	2·658	3·190	3·722	4·253
1 3/4	·5849	1·170	1·755	2·339	2·924	3·509	4·094	4·679
1 1/2	·6380	1·276	1·914	2·552	3·190	3·828	4·466	5·104
1 3/4	·7444	1·489	2.233	2·977	3·722	4·466	5·211	5 955
2	·8507	1·701	2·552	3·403	4·253	5·104	5·955	6·806
2 1/4	·9570	1·914	2·871	3.828	4·785	5 7.42	6·699	7·656
2 1/2	1·063	2·127	3·190	4·253	5·317	6·380	7·444	8·507
2 3/4	1·170	2·339	3·509	4·679	5·849	7·018	8·188	9·358
3	1·276	2·552	3·828	5·104	6·380	7·656	8·932	10·208
3 1/4	1·382	2·765	4·147	5·530	6·912	8·294	9·677	11·059
3 1/2	1·489	2·977	4·466	5·955	7·444	8·932	10·421	11·910
3 3/4	1·595	3·190	4·785	6·380	7·975	9·570	11·165	12.760
4	1·701	3 403	5·104	6 806	8·507	10·208	11·910	13·611
4 1/4	1·808	3·615	5·423	7·231	9.039	10.846	12·654	14·462
4 1/2	1·914	3.828	5·742	7·656	9.570	11·484	13·398	15·313
4 3/4	2·020	4 041	6·061	8 082	10·102	12·122	14·143	16·163
5	2·127	4·254	6·380	8·507	10.634	12·760	14·887	17·014
5 1/2	2·339	4.679	7·018	9·358	11·697	14·037	16·376	18·715
6	2·552	5·104	7·656	10·208	12·761	15·313	17·865	20·417

Round Cast Iron.—The Weight of a Lineal Foot.

Diam. in inches.	Weight in lbs.	Diam. in inches.	Weight in lbs.	Diam. in inches.	Weight in lbs.
1	2·454	5½	74·245	10	245·437
1¼	3·835	5¾	81·148	10¼	257·86
1½	5·522	6	88·357	10½	270·595
1¾	7·517	6¼	95·874	10¾	283·634
2	9·818	6½	103·697	11	296·979
2¼	12·425	6¾	111·827	11¼	310·632
2½	15·340	7	120·264	11½	324·591
2¾	18·561	7¼	129·008	11¾	338·857
3	22·089	7½	138·059	12	353·430
3¼	25·924	7¾	147·416	13	414·789
3½	30·066	8	157·080	14	481·057
3¾	34·515	8¼	167·051	15	552·234
4	39·270	8½	177·329	16	628·320
4¼	44·332	8¾	187·913	17	709·314
4½	49·701	9	198·804	18	795·217
4¾	55·377	9¼	210·002	20	981·750
5	61·359	9½	221·507	22	1187·91
5¼	67·649	9¾	233·319	24	1413·7

Round and Square Brass.—The Weight of a Lineal Foot.

Diam. or Side in in.	Round in lbs.	Square in lbs.	Diam. or Side in in.	Round in lbs.	Square in lbs.
1-16	·0112	·0142	1 5-16	4·933	6·281
⅛	·0447	·0570	1 ⅜	5·414	6·893
3-16	·1012	·1282	1 7-16	5·918	7·534
¼	·1790	·2279	1 ½	6·443	8·203
5-16	·2796	·3560	1 9-16	6·991	8·901
⅜	·4047	·5127	1 ⅝	7·563	9·627
7-16	·5486	·6978	1 11-16	8·155	10·382
½	·7159	·9115	1 ¾	8·789	11·165
9-16	·9060	1·154	1 13-16	9·407	11·977
⅝	1·118	1·424	1 ⅞	10·117	12·817
11-16	1·353	1·723	1 15-16	11·799	13·686
¾	1·611	2·051	2	11·454	14·583
13-16	1·891	2·407	2⅛	12·932	16·463
⅞	2·194	2·791	2¼	14·496	18·457
15-16	2·529	3·204	2⅜	16·152	20·565
1	2·863	3·646	2½	17·896	22·786
1 1-16	3·233	4·116	2⅝	19·731	25·122
1 ⅛	3·624	4·614	2¾	21·655	27·572
1 3-16	4·038	5·141	2⅞	23·670	30·135
1 ¼	4·474	5·697	3	25·771	32·813

CAST-IRON PIPES.—THE WEIGHT OF A LINEAL FOOT.

Bore in inches.	Thickness of Metal in inches.											Bore in inches.
	¼	⅜	½	⅝	¾	⅞	1	1⅛	1¼	1¾		
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		
2	5.522	8.744	12.272	16.107	20.249	24.697	29.452	34.515	39.884	51.542		2
2¼	6.136	9.664	13.499	17.641	22.089	26.845	31.907	37.276	42.952	55.223		2¼
2½	6.750	10.584	14.726	19.175	23.950	28.992	34.361	40.037	46.019	58.905		2½
2¾	7.363	11.505	15.953	20.709	25.771	31.140	36.816	42.798	49.087	62.587		2¾
3	7.977	12.425	17.181	22.243	27.612	32.287	39.270	45.559	52.155	66.268		3
3¼	8.590	13.346	18.408	23.777	29.452	35.435	41.724	48.320	55.223	69.950		3¼
3½	9.204	14.266	19.635	25.311	31.293	37.583	44.179	51.082	58.291	73.631		3½
3¾	9.817	15.186	20.862	26.845	33.134	39.730	46.633	53.843	61.359	77.313		3¾
4	10.431	16.109	22.089	28.379	34.975	41.878	49.087	56.604	64.427	80.994		4
4¼	11.045	17.027	23.317	29.913	36.816	44.025	51.542	59.365	67.495	84.676		4¼
4½	11.658	17.948	24.544	31.447	38.656	46.177	53.996	62.126	70.563	88.357		4½
4¾	12.272	18.868	25.771	32.981	40.497	48.320	56.451	64.888	73.631	92.039		4¾
5	12.885	19.788	26.998	34.515	42.338	50.468	58.905	67.649	76.699	95.721		5
5½	14.113	21.629	29.452	37.583	46.020	54.763	63.814	73.171	82.835	103.084		5½
6	15.340	23.470	31.908	40.651	49.701	59.058	68.722	78.693	88.971	110.447		6
6½	16.567	25.311	34.361	43.719	53.383	63.351	73.631	84.216	95.107	117.810		6½
7	17.794	27.152	36.816	46.787	57.064	67.649	78.540	89.738	101.243	125.173		7
7½	19.021	28.992	39.270	49.854	60.746	71.944	83.449	95.260	107.379	132.536		7½
8	20.249	30.833	41.724	52.922	61.427	76.239	88.357	100.783	113.515	139.899		8
8½	21.476	32.674	44.179	55.990	68.109	80.534	93.266	106.305	119.651	147.262		8½
9	22.703	34.515	46.633	59.058	71.790	84.829	98.175	111.827	125.787	154.626		9
9½	23.930	36.355	49.087	62.126	75.472	89.124	103.084	117.350	131.923	161.989		9½
10	25.157	38.196	51.541	65.194	79.154	93.420	107.992	122.872	138.059	169.352		10
10½	26.385	40.037	53.996	68.262	82.835	97.715	112.901	128.394	144.195	176.715		10½
11	27.612	41.878	56.451	71.330	86.517	102.010	117.810	133.917	150.330	184.078		11
12	30.066	45.559	61.359	77.466	93.880	110.600	127.627	144.962	162.602	198.804		12
13	32.520	49.241	66.268	83.602	101.243	119.191	137.445	156.006	174.874	213.531		13
14	34.975	52.922	71.177	89.738	108.606	127.781	147.262	167.051	187.146	228.257		14

CAST-IRON PIPES—*continued*

Bore in inches.	Thickness of Metal in inches.									Bore in Inches.
	⅜	½	⅝	¾	⅞	1	1⅛	1¼	1½	
	lbs	lbs.	lbs.	lbs	lbs.	lbs.	lbs.	lbs.	lbs.	
15	56·604	76·086	95·874	115·969	136·371	157·080	178·096	199·418	242·983	15
16	60·286	80·994	102.010	123·332	144·962	166·897	189·140	211·690	257·709	16
17	63·967	85·903	108·146	130·695	153·552	176·715	200·185	223 962	272·436	17
18	67·649	90·812	114·282	138·059	162·142	186·532	211·230	236·234	287·162	18
19	..	95·721	120·418	145·422	170·732	196·350	221·273	248.505	301·888	19
20	..	100·629	126·554	152·785	179.323	206·167	233·319	260·777	316·614	20
21	..	105·538	132·690	160·148	187·913	215·985	244·364	373·049	331·341	21
22	..	110·447	138·826	167·511	196·503	225·802	255·408	285·321	346·067	22
23	..	115·356	144·962	174·874	205·094	235·620	·66·453	297·593	360.793	23
24	..	120 264	151·097	182 237	213·684	245·437	277·498	309·865	375·519	24
25	..	125·173	157·233	189·600	222·274	255·255	288·542	322·137	390·246	25
26	..	130·082	163·369	196·964	230·865	265·072	299 587	334·409	404.972	26
27	..	134·991	169·505	204·327	239·455	274·890	310·632	346·680	419·698	27
28	..	139 899	175·641	211·690	248·045	284·707	321·677	358·952	434·424	28
29	..	144·808	181·776	219·053	256·636	294·525	332·721	371·224	449·151	29
30	..	149·717	187·913	226·416	265·226	304 342	343·766	383·496	463·877	30

WEIGHT OF CAST-IRON SOCKET PIPES.

TABLE OF THE WEIGHT OF CAST-IRON FLANGED

Weight of Cast-iron Socket Pipes.

For a Head of Water = 300 feet and under.

Bore.	Length when Laid.	Length of Socket	Thickness of Metal.	Weight of each pipe.	Size of Lead Joint.	Weight of Lead Joint.
inches.	ft. in.	inches.	inches.	lbs.	inches.	lbs.
1½	6 0	3	¼	30	1½ × ¼	1·2
2	"	"	5-16	51	"	1·4
2½	"	3¼	"	62	"	1·6
3	9 0	3½	⅜	121	1¾ × ¼	2·3
3½	"	"	"	137	"	2·8
4	"	4	"	157	2 × 5-16	4·0
4½	"	"	7-16	210	"	4·5
5	"	"	"	233	"	5 0
6	"	4¼	½	314	2¼ × 5-16	6·5
7	"	"	"	359	"	7·7
8	"	"	"	408	"	8·2
9	"	4½	9-16	527	2½ × 5-16	10·4
10	"	"	"	573	"	11·5
11	"	"	"	672	"	14·9
12	"	"	⅝	755	2¾ × ⅜	18·2
13	"	"	"	824	"	19·6
14	"	"	"	882	"	20 8
15	"	"	"	948	"	22·2
16	"	"	¾	1217	"	23·8
17	"	"	"	1289	"	25·2
18	"	"	"	1365	"	26·6
19	"	"	"	1452	"	27·9
20	"	"	⅞	1794	"	29 6
22	"	"	"	1964	"	32·3
24	"	"	"	2136	"	35.0

Table of the Weight of Cast-iron Flanged Pipes in Nine Feet Lengths.

(Nystrom.)

Bore in in.	Thickness of Metal.	Diameter of Flanges.	Thickness of Flanges.	Diameter of Circle through Holes.	Diameter and Number of Holes.		Weight per Pipe.		
	inches.	inches.	inches.	inches.	in.	No.	cwt.	qrs.	lbs.
2	⅜	6½	9-16	4¾	⅝	4	0	3	0
3	⅜	7½	⅝	6	⅝	4	1	0	3
4	½	9½	¾	7¾	¾	4	1	3	5
5	½	10½	⅞	8¾	¾	4	2	1	12
6	⅝	12	⅞	10	⅞	4	3	2	1
7	⅝	14	1	11¾	1	6	4	3	17
8	¾	15	1	12¾	1	6	5	2	9
9	¾	16½	1 1-16	14¼	1	6	6	1	12
10	¾	17½	1⅛	15½	1	6	8	0	0
11	⅞	19	1 3-16	16¾	1	6	8	3	24
12	⅞	20	1¼	17¾	1⅛	6	9	3	5
13	⅞	21	1¼	18¾	1⅛	6	10	2	0
14	⅞	22	1¼	19¾	1⅛	8	11	0	26
15	⅞	23	1¼	20¾	1⅛	8	12	0	25
16	⅞	24½	1 5-16	22	1¼	8	12	3	8
17	⅞	25½	1 5-16	23	1¼	8	13	2	17
18	1	26½	1⅜	24	1¼	8	16	1	15
19	1	28	1⅜	25	1⅜	8	17	2	13
20	1	29	1⅜	26	1⅜	8	18	0	26

NOTE.—Indiarubber rings form the best packing for the joints of flange-pipes.

VARIOUS METALS.—THE WEIGHT OF A SUPERFICIAL FOOT.

Thickness in inches.	Wrought Iron.	Cast Iron.	Steel.	Copper.	Brass.	Lead.	Zinc.	Thickness in inches.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
1-16	2 526	2.344	2.552	2.891	2.734	3.708	2.344	1-16
⅛	5.052	4.687	5.104	5.781	5.469	7.417	4.687	⅛
3-16	7.578	7.031	7 656	8.672	8.203	11.125	7.031	3-16
¼	10.104	9.375	10.208	11.563	10.938	14.833	9.375	¼
5-16	12.630	11.719	12 760	14.453	13.672	18.542	11.719	5-16
⅜	15.156	14.062	15.312	17.344	16.406	22.250	14.062	⅜
7-16	17.682	16.406	17.865	20.234	19.141	25.958	16 406	7-16
½	20.208	18.750	20.417	23.125	21.875	29.667	18.750	½
9-16	22.734	21.094	22.969	26.016	24.609	33.375	21.094	9-16
⅝	25.260	23.437	25.521	28.906	27 344	37.083	23.437	⅝
11-16	27.786	25 781	28.073	31.797	30 078	40.792	25.781	11-16
¾	30.312	28.125	30 625	34.688	32.813	44.500	28.125	¾
13-16	32.839	30.469	33 177	37.578	35.547	48 208	30.469	13-16
⅞	35.365	32.812	35.729	40.469	38 281	51.917	32.812	⅞
15-16	37.891	35.156	38.281	43.359	41.016	55.625	35.156	15-16
1	40.417	37.500	40 833	46.250	43.750	59.333	37.500	1

Add for each side in GALVANIZED IRON .096 lbs. per ft. sup.

WROUGHT-IRON PIPES.—THE WEIGHT OF A LINEAL FOOT.

Bore in inches.	Thickness of Metal in parts of an inch.								Bore in inches.
	1-16	⅛	3-16	¼	5-16	⅜	7-16	½	
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
¼	.208	.497	.869	1.324	1.861	2.481	3.184	3.969	¼
⅜	.289	.661	1.116	1.653	2.273	2.976	3 761	4.629	⅜
½	.372	.827	1.364	1.984	2.687	3.472	4 340	5.291	½
⅝	.455	1.092	1.612	2.315	3.100	3.968	4.919	5.952	⅝
¾	.537	1.157	1.860	2.645	3.513	4.464	5.497	6.613	¾
⅞	.620	1.323	2.108	2.976	3.927	4.960	6.076	7.274	⅞
1	.703	1.488	2.356	3.307	4.340	5.456	6 654	7.936	1
1¼	.868	1.819	2.852	3.968	5.167	6.448	7.812	9.258	1¼
1½	1.033	2.149	3.348	4.029	5.993	7.440	8.969	10 581	1½
1¾	1.199	2.480	3.844	5.291	6.820	8.432	10.126	11.904	1¾
2	1.364	2.811	4.340	5.952	7.646	9.424	11.284	13 226	2
2¼	1.529	3.131	4.836	6.613	8.473	10.416	12.441	14.549	2¼
2½	1.695	3.472	5.332	7 274	9.300	11.408	13 598	15 872	2½
2¾	1.860	3.803	5.828	7.936	10.126	12.400	14 756	17.194	2¾
3	2.025	4 133	6.324	8.607	10.953	13.392	15.913	18 517	3

Flat Bar Iron.—Weight of a Lineal Foot.

Width in inches.	Thickness in inches. 1-16	1-8	3-16.	¼	5-16.	⅜	7-16	½	⅝	¾	⅞	1	Width. in inches.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
1-16	.0132	.0263	.0395	.0526	.0658	.0789	.0921	.1053	.1316	.1579	.1842	.2105	1-16
⅛	.0263	.0526	.0789	.1053	.1316	.1579	.1842	.2105	.2631	.3158	.3684	.4210	⅛
3-16	.0395	.0789	.1184	.1579	.1973	.2368	.2763	.3158	.3947	.4736	.5526	.6315	3-16
¼	.0526	.1053	.1579	.2105	.2631	.3158	.3684	.4210	.5263	.6315	.7368	.8420	¼
5-16	.0658	.1316	.1973	.2631	.3289	.3947	.4605	.5263	.6578	.7894	.9210	1.053	5-16
⅜	.0789	.1579	.2368	.3158	.3947	.4736	.5526	.6315	.7894	.9473	1.105	1.263	⅜
7-16	.0921	.1842	.2763	.3684	.4605	.5526	.6447	.7368	.9210	1.105	1.289	1.474	7-16
½	.1053	.2105	.3158	.4210	.5263	.6315	.7368	.8420	1.053	1.263	1.474	1.684	½
9-16	.1184	.2368	.3552	.4736	.5920	.7104	.8289	.9473	1.184	1.421	1.658	1.895	9-16
⅝	.1316	.2631	.3947	.5263	.6578	.7894	.9210	1.053	1.316	1.579	1.842	2.105	⅝
11-16	.1447	.2894	.4342	.5789	.7236	.8683	1.013	1.158	1.447	1.737	2.026	2.316	11-16
¾	.1579	.3158	.4736	.6315	.7894	.9473	1 105	1.263	1.579	1.895	2.210	2.526	¾
13-16	.1710	.3421	.5131	.6841	.8552	1.026	1.197	1.368	1.710	2.052	2.394	2.737	13-16
⅞	.1842	.3684	.5526	.7368	.9210	1.105	1.289	1.474	1.842	2.210	2.579	2.947	⅞
15-16	.1973	.3947	.5920	.7894	.9867	1.184	1.381	1.579	1.973	2 368	2 763	3.158	15-16
1	.210	.421	.632	.842	1.053	1.263	1.474	1.684	2.105	2.526	2 947	3.368	1
1⅛	.237	.474	.710	.947	1.184	1.421	1.658	1.895	2.368	2.842	3.315	3.789	1⅛
1¼	.263	.526	.789	1.053	1 316	1.579	1.842	2.105	2.631	3.158	3.684	4.210	1¼
1⅜	.289	.579	.868	1.158	1.447	1.737	2.026	2.316	2.894	3.473	4.052	4.631	1⅜
1½	.316	.632	.947	1.263	1.579	1.895	2.210	2.526	3.158	3.789	4.421	5.052	1½
1⅝	.342	.684	1.026	1.368	1.710	2.052	2.394	2.737	3.421	4.105	4.789	5.473	1⅝
1¾	.368	.737	1.105	1.474	1.842	2.210	2.579	2.947	3.684	4.421	5.157	5.894	1¾
1⅞	.395	.789	1.184	1.579	1.973	2.368	2.763	3.158	3.947	4.736	5.526	6.315	1⅞
2	.421	.842	1 263	1.684	2.105	2.526	2.947	3.368	4.210	5.052	5.894	6.736	2
2⅛	.447	.895	1.342	1.789	2.237	2.684	3.131	3.579	4.473	5.368	6.262	7.157	2⅛

FLAT BAR IRON—*Continued.*

Width in inches.	Thickness in inches.												Width in inches.
	1-16	1/8	3-16	1/4	5-16	3/8	7-16	1/2	5/8	3/4	7/8	1	
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
2 1/4	.474	.947	1.421	1 895	2.368	2.842	3.315	3.789	4.736	5.684	6.831	7.578	2 1/4
2 3/8	.500	1.000	1.500	2.000	2.500	3 000	3.500	4.000	4.999	5.999	6.999	7 999	2 3/8
2 1/2	.526	1.053	1.579	2.105	2.631	3.158	3.684	4.210	5.263	6.315	7.368	8.420	2 1/2
2 5/8	.553	1.105	1.658	2.210	2.763	3.315	3.868	4.42	5.526	6.631	7.736	8.841	2 5/8
2 3/4	.579	1.158	1.737	2.316	2.894	3.473	4 052	4.631	5.789	6.947	8.104	9.262	2 3/4
2 7/8	.605	1.210	1.816	2 421	3.026	3.631	4 236	4.842	6.052	7.262	8.473	9.683	2 7/8
3	.632	1.263	1.895	2.526	3.158	3.789	4.421	5.052	6.315	7 578	8.841	10.104	3
3 1/4	.684	1.368	2.052	2.737	3.421	4.105	4.789	5.473	6.841	8.210	9.578	10.946	3 1/4
3 1/2	.737	1.474	2.210	2.947	3 684	4.421	5.157	5.894	7.368	8.841	10.315	11.788	3 1/2
3 3/4	.789	1.579	2.368	3.158	3.947	4.736	5.526	6.315	7.894	9.473	11.051	12.630	3 3/4
4	.842	1 684	2.526	3.368	4.210	5.052	5.894	6.736	8.420	10.104	11.788	13.472	4
4 1/4	.895	1.789	2.684	3.579	4.473	5.368	6.262	7.157	8.946	10.736	12.525	14.314	4 1/4
4 1/2	.947	1.895	2.842	3.789	4.736	5.684	6.631	7.578	9.473	11.367	13.262	15.156	4 1/2
4 3/4	1.000	2.000	3.000	4.000	4.999	5.999	6.999	7.999	9.999	11.999	13.998	15.998	4 3/4
5	1.053	2.105	3.158	4.210	5.263	6.315	7.368	8.420	10.525	12.630	14 735	16.840	5
5 1/4	1.105	2.210	3.315	4.421	5.526	6.631	7.736	8.841	11.051	13.262	15.472	17.682	5 1/4
5 1/2	1.158	2.316	3.473	4.631	5.789	6.947	8.104	9.262	11.578	13.893	16.209	18.524	5 1/2
5 3/4	1 210	2.421	3.631	4.842	6.052	7.262	8.473	9.683	12.104	14.525	16.946	19.366	5 3/4
6	1.263	2.526	3.789	5.052	6.315	7.578	8.841	10.104	12.630	15.156	17.682	20.208	6

5¾	1.216	2.421	3.631	4.842	6.052	7.262	8.473	9.683	12.104	14.525	16.946	19.366	5½
6	1.263	2.526	3.789	5.052	6.315	7.578	8.841	10.104	12.630	15.156	17.682	20.208	6

Copper Bar.—The Weight of a Lineal Foot.

Diam. or Side in in.	Round in lbs.	Square in lbs.	Diam. or Side in in.	Round in lbs.	Square in lbs.
½	.047	.060	1½	6.811	8.672
3-16	.106	.135	1 9-16	7.390	9.410
¼	.189	.241	1⅝	7.993	10.177
5-16	.296	.376	1¾	9.270	11.803
⅜	.426	.542	1⅞	10.642	13.550
7-16	.579	.738	2	12.108	15.417
½	.757	.964	2⅛	13.668	17.404
9-16	.958	1.219	2¼	15.325	19.512
⅝	1.182	1.506	2⅜	17.075	21.740
11-16	1.431	1.822	2½	18.916	24.089
¾	1.703	2.168	2⅝	20.856	26.558
13-16	1.998	2.544	2¾	22.891	29.146
⅞	2.318	2.951	2⅞	25.019	31.856
15-16	2.661	3.387	3	27.244	34.688
1	3.027	3.854	3⅛	29.559	37.638
1 1-16	3.417	4.351	3¼	31.972	40.710
1⅛	3.831	4.878	3⅜	34 482	43.901
1 3-16	4.269	5.435	3½	37 081	47.214
1¼	4.730	6.022	3⅝	39.777	50.646
1 5-16	5.214	6.634	3¾	42.568	54.199
1⅜	5.723	7.287	3⅞	45.550	57.873
1 7-16	6.255	7 964	4	48.433	61.667

Chains.—Weight of a Lineal Foot.

Diam. of Link in in.	Weight in lbs.	Diam. of Link in in.	Weight in lbs.	Diam. of Link in in.	Weight in lbs.
¼	.63	¾	5.33	1¼	14.50
5-16	.91	13 16	6.16	1 5-16	16.00
⅜	1.33	⅞	7.16	1⅜	17.66
7-16	1.50	15-16	8.16	1½	20.83
½	2.33	1	9.33	1⅝	24.17
9-16	3.00	1 1-16	10.50	1¾	28.33
⅝	3.67	1⅛	11.83	1⅞	32.50
11-16	4 50	1 3-16	13 16	2	38.33

Note.—The Chains over 1 inch diameter are assumed to be made with studs.

Hoop Iron.—Weight of 100 Lineal Feet.

B. W. Gauge.	Width in ins.	Weight in lbs.	B. W. Gauge.	Width in ins.	Weight in lbs.
11	3	126.302	15	1½	36.375
11	2¾	115.777	15	1⅜	33.344
12	2½	91.780	16	1¼	26.523
12	2	73.424	17	1⅛	20.840
13	2¼	71.234	18	1	16.167
13	2	63.319	19	⅞	12.378
13	1¾	55.405	20	¾	8.841
14	1¾	47.153	21	⅝	6.947
14	1½	40.417			

Copper Pipes —The Weight of a Lineal Foot.

Bore in inches.	Thickness of Metal in parts of an inch.							
	1-16	⅛	3-16	¼	5-16	⅜	7-16	½
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
3-16	·189	·473	·851	1 324	1·892	2·554	3·311	4·162
¼	·236	·568	·993	1·514	2·128	2·838	3·642	4·541
5-16	·284	·662	1·135	1·703	2·365	3·121	3·973	4·918
⅜	·331	·757	1·277	1·892	2·601	3 406	4·304	5·297
7-16	·378	·851	1·419	2·081	2·838	3·689	4·635	5·675
½	·426	·946	1·561	2·270	3·075	3·973	4·966	6·054
9-16	·473	1·040	1·703	2·459	3·311	4·256	5·297	6·432
⅝	·520	1·185	1·845	2·649	3·547	4·540	5·629	6·811
11-16	·568	1·230	1·986	2·838	3·783	4·824	5·959	7·190
¾	·615	1·324	2·129	3·027	4·020	5·108	6·290	7·568
13-16	·662	1·419	2·271	3·216	4·257	5·392	6·622	7·946
⅞	·709	1·514	2·412	3·405	4·493	5·676	6·953	8·324
15-16	·757	1·608	2·554	3·594	4·729	5·960	7·284	8·703
1	·804	1·703	2·696	3·784	4·966	6·243	7·615	9·081
1¼	·993	2·081	3·263	4·540	5·912	7·378	8·938	10·595
1½	1·182	2·459	3·831	5·297	6·857	8·514	10·264	12·105
1¾	1·372	2·833	4·398	6·055	7·805	9·646	11·586	13·621
2	1·560	3·217	4·967	6·808	8·748	10·783	12·911	15.135
2¼	1·750	3·591	5·531	7·566	9·694	11·918	14·234	16·647
2½	1·940	3·975	6·103	8·327	10·643	13·266	15·565	18·165
2¾	2·128	4·352	6·668	9·081	11·590	14·190	16·886	19·677
3	2·316	4·729	7·238	9·737	12·534	15·325	18·212	21·190

Weight per foot run in lbs. = 3·027 D2 – D′2, D and D′ being the external and internal diameter in inches.

Brass Pipes —The Weight of a Lineal Foot.

Bore in inches.	Thickness of Metal in parts of an inch.							
	1-16	⅛	3-16	¼	5-16	⅜	7-16	½
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
3-16	·178	·447	·805	1·252	1·790	2·428	3·132	3·937
¼	·226	·537	·940	1·432	2·015	2·684	3·445	4·295
5-16	·269	·626	1·074	1·611	2·260	2·953	3·758	4·653
⅜	·311	714	1·206	1 790	2·459	3·219	4·069	5·009
7-16	·357	·805	1·342	1 981	2·684	3.489	4·384	5·369
½	·403	·895	1·478	2·148	2 908	3·758	4·698	5·727
9 16	·447	·985	1·623	2·327	3·132	4·027	5·012	6·085
⅝	·492	1·076	1·745	2·506	3·356	4 295	5·324	6.445
11-16	·537	1·176	1 880	2·684	3·579	4·564	5·637	6·801
¾	·584	1·253	2·013	2·863	3·803	4·832	5·953	7·179
13-16	·638	1·342	2·147	3·042	4·027	5·100	6·264	7 616
⅞	·669	1·430	2·280	3.219	4·248	5·369	6·595	7·922
15-16	·704	1·509	2·404	3.388	4·462	5.625	6·888	8·227
1	761	1·611	2·550	3·579	4·700	5·926	72·53	8·590
1⅛	·850	1·790	2·819	3 939	5·165	6·493	7·830	9.308

Brass Pipes.—The Weight of a Lineal Foot.—*continued.*

Bore in inches.	Thickness of Metal in parts of an inch.							
	1-16	⅛	3-16	¼	5-16	⅜	7-16	½
	lbs.	lbs.	lbs.	lbs-	lbs	lbs.	lbs.	lbs.
1¼	·940	1·969	3·089	4·315	5·643	6·980	8·458	10.022
1⅜	1·029	2·150	3 376	4·703	6·040	7·519	9 082	10·738
1½	1·121	2·347	3·674	5·011	6·489	8·053	9·709	11·454
1⅝	1·226	2·554	3·890	5·369	6·933	8·588	10·333	12·168
1¾	1·327	2·664	4·143	5·706	7·362	9.107	10·942	12·865
1⅞	1·337	2·815	4·379	6·035	7.780	9 614	11·538	13·553
2	1·478	3·042	4·698	6·443	8·277	10 201	12·216	14·317
2¼	1·655	3·400	5·235	7·159	9·174	11·276	13·467	15·749
2½	1·833	3·758	5·774	7 874	10·067	12·349	14·722	17·181
2¾	2·015	4·116	6·309	8·590	10·964	13·422	15·973	18·812
3	2·192	4·474	6·847	9·306	11·856	14·696	17·225	20·044

Weight per foot run in lbs. = 2·8634 D2 – D'2, D and D' being the external and internal diameter in inches.

Lead Pipes.—The Weight of a Lineal Foot.

Bore in inches.	Thickness of Metal in parts of an inch.					
	1-16	⅛	3-16	¼	5-16	⅜
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
3-16	·243	·607	1·092	1·699	2·427	3·277
¼	·303	·728	1·273	1·942	2·730	3·641
5-16	·364	·850	1·456	2·184	3·034	4·004
⅜	·425	·971	1·638	2 427	3·337	4·369
7-16	·485	1·092	1·820	2·670	3·640	4·733
½	·546	1·214	2·013	2·913	3·944	5·097
9-16	·607	1·335	2·184	3·155	4·248	5·460
⅝	·667	1·520	2·366	3·398	4·551	5·825
11-16	·728	1·578	2·548	3·641	4·853	6·189
¾	·789	1·699	2·731	3·873	5·157	6·553
13-16	·851	1·820	2·913	4·126	5·461	6·917
⅞	·910	1·942	3·095	4·368	5·764	7·281
15-16	·971	2·063	3·276	4·611	6·067	7·646
1	1·032	2·184	3·457	4·854	6 371	8·009
1¼	1·274	2·670	4·186	5·825	7·585	9·466
1½	1·517	3·155	4·915	6·796	8·796	10·923
1¾	1 760	3·641	5 642	7·768	10·013	12·375
2	2·001	4·127	6·372	8·734	11·223	13·833
2¼	2·245	4·607	7·096	9·707	12·436	15·290
2½	2·489	5·100	7·829	10·683	13·654	16·762
2¾	2·729	5·583	8·554	11·650	14·869	18·204
3	2·971	6·066	9·286	12·621	16·080	19·660

Weight per foot run = 3·8834 D2 – D'2, D and D' being the external and internal diameter in inches.

THE WEAR AND TEAR OF BUILDING MATERIALS.

At the tenth annual meeting of the Fire Underwriters' Association of the Northwest, held at Chicago in September, 1879, Mr. A. W. Spalding read a paper on the wear and tear of building materials, and tabulated the result of his investigations in the following form :

Material in Building.	Frame dwelling.		Brick dwelling, (shingle roof.)		Frame store.		Brick store, (shingle roof.)	
	Average life. Years.	Per cent. of depreciation per annum.	Average life. Years.	Per cent. of depreciation per annum.	Average life. Years.	Per cent. of depreciation per annum.	Average life. Years.	Per cent. of depreciation per annum.
Brick	—	—	75	1⅓	—	—	66	1½
Plastering	20	5	30	3⅓	16	6	30	3½
Painting, outside	5	20	7	14	5	20	6	16
Painting, inside	7	14	7	14	5	20	6	16
Shingles	16	6	16	6	16	6	16	6
Cornice	40	2½	40	2½	30	3⅓	40	2½
Weather-boarding	30	3⅓	—	—	30	3⅓	—	—
Sheathing	50	2	50	2	40	2½	50	2
Flooring	20	5	20	5	13	8	13	8
Doors, complete	30	3⅓	30	3⅓	25	4	30	3⅓
Windows, complete	30	3⅓	30	3⅓	25	4	30	3⅓
Stairs and newel	30	3⅓	30	3⅓	20	5	20	5
Base	40	2½	40	2½	30	3½	30	3½
Inside blinds	30	3⅓	30	3⅓	30	3⅓	30	3⅓
Building hardware	20	5	20	5	13	8	13	8
Piazzas and porches	20	5	20	5	20	5	20	5
Outside blinds	16	6	16	6	16	6	16	6
Sills and first-floor joints	25	4	40	2½	25	4	30	3⅓
Dimension lumber	50	2	75	1⅓	40	2½	66	1½

These figures represent the averages deduced from the replies made by eighty-three competent builders unconnected with fire-insurance companies, in twenty-seven cities and towns of the eleven Western States.

SASH WEIGHTS

REQUIRED FOR THE FOLLOWING SIZED WINDOWS:

SIZE OF GLASS.	THICKNESS.	NO. OF LIGHTS.	WEIGHT—LBS.
10 x 14	1⅜	12	6
10 x 16	"	8	6
12 x 14	"	8	6
10 x 15	"	12	7
10 x 16	"	12	7
10 x 18	"	8	7
10 x 20	"	8	7
12 x 15	"	8	7
12 x 16	"	8	7
14 x 16	"	8	7
10 x 18	"	12	8
12 x 18	"	8	8
12 x 20	"	8	8
12 x 22	"	8	8
14 x 18	"	8	8
14 x 20	"	8	8
12 x 36	"	4	8
10 x 20	"	12	9
12 x 24	"	8	9
15 x 22	"	8	9
12 x 40	"	4	9
12 x 44	"	4	9
14 x 36	"	4	9
10 x 22	"	12	10
10 x 24	"	12	10
12 x 18	"	12	10
12 x 20	"	12	10
14 x 22	"	8	10
14 x 24	"	8	10
14 x 40	"	4	10
14 x 44	"	4	10
12 x 22	"	12	11
15 x 48	1¾	4	12

NOTE.—Four weights required for each window.

STAIRCASES—PROPORTION OF TREADS AND RISERS.

WIDTH OF TREAD.	HEIGHT OF RISER.	WIDTH OF TREAD.	HEIGHT OF RISER.
6 inches	8½ inches.	11 inches	6 inches
7 "	8 "	12 "	5½ "
8 "	7½ "	13 "	5 "
9 "	7 "	14 "	4½ "
10 "	6½ "	15 "	4 "

TABLES

Showing Amount of a Workman's Wages from 15 Cents to 45½ Cents per Hour,

FOR ANY NUMBER OF HOURS,

FROM 1 TO 120 (A FORTNIGHT).

AT 15 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	4.57	60½	9.07	90½	13.57
		31	4.65	61	9.15	91	13.65
		31½	4.72	61½	9.22	91½	13.72
2	0.30	32	4.80	62	9.30	92	13.80
2½	0.37	32½	4.87	62½	9.37	92½	13.87
3	0.45	33	4.95	63	9.45	93	13.95
3½	0.52	33½	5.02	63½	9.52	93½	14.02
4	0.60	34	5.10	64	9.60	94	14.10
4½	0.67	34½	5.17	64½	9.67	94½	14.17
5	0.75	35	5.25	65	9.75	95	14.25
5½	0.82	35½	5.32	65½	9.82	95½	14.32
6	0.90	36	5.40	66	9 90	96	14.40
6½	0.97	36½	5.47	66½	9.97	96½	14.47
7	1.05	37	5.55	67	10.05	97	14.55
7½	1.12	37½	5.62	67½	10.12	97½	14.62
8	1.20	38	5.70	68	10.20	98	14.70
8½	1.27	38½	5.77	68½	10.27	98½	14.77
9	1.35	39	5.85	69	10.35	99	14.85
9½	1.42	39½	5.92	69½	10.42	99½	14.92
10	1.50	40	6.00	70	10.50	100	15.00
10½	1.57	40½	6.07	70½	10.57	100½	15 07
11	1.65	41	6.15	71	10.65	101	15.15
11½	1.72	41½	6.22	71½	10.72	101½	15.22
12	1.80	42	6.30	72	10.80	102	15.30
12½	1.87	42½	6.37	72½	10.87	102½	15.77
13	1.95	43	6.45	73	10.95	103	15.45
13½	2.02	43½	6.52	73½	11.02	103½	15.52
14	2.10	44	6.60	74	11.10	104	15.60
14½	2.17	44½	6.67	74½	11.17	104½	15.67
15	2.25	45	6.75	75	11.25	105	15.75
15½	2.32	45½	6.82	75½	11.32	105½	15.82
16	2.40	46	6.90	76	11.40	106	15.90
16½	2.47	46½	6.97	76½	11.47	106½	15.97
17	2.55	47	7.05	77	11.55	107	16.05
17½	2.62	47½	7.12	77½	11.62	107½	16.12
18	2.70	48	7.20	78	11.70	108	16.20
18½	2.77	48½	7.27	78½	11.77	108½	16.27
19	2.85	49	7 35	79	11.85	109	16.35
19½	2.92	49½	7.42	79½	11.92	109½	16.42
20	3.00	50	7.50	80	12.00	110	16.50
20½	3.07	50½	7.57	80½	12.07	110½	16.57
21	3.15	51	7.65	81	12.15	111	16.65
21½	3.22	51½	7.72	81½	12.22	111½	16.72
22	3.30	52	7.80	82	12.30	112	16.80
22½	3.37	52½	7.87	82½	12.37	112½	16.87
23	3.45	53	7.95	83	12.45	113	16.95
23½	3.52	53½	8.02	83½	12.52	113½	17.02
24	3.60	54	8.10	84	12.60	114	17.10
24½	3.67	54½	8.17	84½	12.67	114½	17.17
25	3.75	55	8.25	85	12.75	115	17.25
25½	3.82	55½	8.33	85½	12.82	115½	17.32
26	3.90	56	8.40	86	12.90	116	17.40
26½	3.98	56½	8.47	86½	12.97	116½	17.47
27	4.05	57	8.55	87	13.05	117	17.55
27½	4.12	57½	8.62	87½	13.13	117½	17.62
28	4.20	58	8.70	88	13.20	118	17.70
28½	4.27	58½	8.77	88½	13.27	118½	17.77
29	4.35	59	8.85	89	13.35	119	17.85
29½	4.42	59½	8.92	89½	13.42	119½	17.92
30	4.50	60	9.00	90	13.50	120	18.00

AT 15½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	4.73	60½	9.38	90½	14.03
		31	4.80	61	9.45	91	14.10
		31½	4.88	61½	9.53	91½	14.18
2	0.31	32	4.96	62	9.61	92	14.26
2½	0.39	32½	5.04	62½	9.69	92½	14.34
3	0.46	33	5.11	63	9.76	93	14.41
3½	0.54	33½	5.19	63½	9.84	93½	14.49
4	0.62	34	5.27	64	9.92	94	14.57
4½	0.70	34½	5.35	64½	10.00	94½	14.65
5	0.77	35	5.42	65	10.07	95	14.72
5½	0.85	35½	5.50	65½	10.15	95½	14.80
6	0.93	36	5.58	66	10.23	96	14.88
6½	1.01	36½	5.66	66½	10.31	96½	14.96
7	1.08	37	5.73	67	10.38	97	15.03
7½	1.16	37½	5.81	67½	10.46	97½	15.11
8	1.24	38	5.89	68	10.54	98	15.19
8½	1.32	38½	5.97	68½	10.62	98½	15.27
9	1.39	39	6.04	69	10.69	99	15.34
9½	1.47	39½	6.12	69½	10.77	99½	15.42
10	1.55	40	6.20	70	10.85	100	15.50
10½	1.63	40½	6.28	70½	10.93	100½	15.58
11	1.70	41	6.35	71	11.00	101	15.66
11½	1.78	41½	6.43	71½	11.08	101½	15.74
12	1.86	42	6.51	72	11.16	102	15.82
12½	1.94	42½	6.59	72½	11.24	102½	15.90
13	2.01	43	6.66	73	11.31	103	15.97
13½	2.09	43½	6.74	73½	11.39	103½	16.05
14	2.17	44	6.82	74	11.47	104	16.13
14½	2.25	44½	6.90	74½	11.55	104½	16.21
15	2.32	45	6.97	75	11.62	105	16.28
15½	2.40	45½	7.05	75½	11.70	105½	16.36
16	2.48	46	7.13	76	11.78	106	16.44
16½	2.56	46½	7.21	76½	11.86	106½	16.52
17	2.63	47	7.28	77	11.93	107	16.59
17½	2.71	47½	7.36	77½	12.01	107½	16.66
18	2.79	48	7.44	78	12.09	108	16.74
18½	2.87	48½	7.52	78½	12.17	108½	16.82
19	2.94	49	7.59	79	12.24	109	16.89
19½	3.02	49½	7.67	79½	12.32	109½	16.97
20	3.10	50	7.75	80	12.40	110	17.05
20½	3.18	50½	7.83	80½	12.48	110½	17.13
21	3.25	51	7.90	81	12.55	111	17.21
21½	3.33	51½	7.98	81½	12.63	111½	17.29
22	3.41	52	8.06	82	12.71	112	17.37
22½	3.49	52½	8.14	82½	12.79	112½	17.45
23	3.56	53	8.21	83	12.86	113	17.52
23½	3.64	53½	8.29	83½	12.94	113½	17.60
24	3.72	54	8.37	84	13.02	114	17.68
24½	3.80	54½	8.45	84½	13.10	114½	17.76
25	3.87	55	8.52	85	13.17	115	17.83
25½	3.95	55½	8.60	85½	13.25	115½	17.91
26	4.03	56	8.68	86	13.33	116	17.99
26½	4.11	56½	8.76	86½	13.41	116½	18.07
27	4.18	57	8.83	87	13.48	117	18.13
27½	4.26	57½	8.91	87½	13.56	117½	18.21
28	4.34	58	8.99	88	13.64	118	18.29
28½	4.42	58½	9 07	88½	13.72	118½	18.37
29	4.49	59	9.14	89	13.79	119	18.44
29½	4 57	59½	9.22	89½	13.87	119½	185 2
30	4.65	60	9.30	90	13.95	120	18.60

AT 16 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	4.88	60½	9.68	90½	14.48
		31	4.96	61	9.76	91	14.56
		31½	5.04	61½	9.84	91½	14.64
2	0.32	32	5.12	62	9 92	92	14.72
2½	0.40	32½	5.20	62½	10.00	92½	14.80
3	0.48	33	5.28	63	10.08	93	14.88
3½	0.56	33½	5.36	63½	10.16	93½	14.96
4	0.64	34	5.44	64	10.24	94	15.04
4½	0.72	34½	5.52	64½	10.32	94½	15.12
5	0.80	35	5.60	65	10.40	95	15.20
5½	0.88	35½	5.68	65½	10.48	95½	15.28
6	0.96	36	5.76	66	10.56	96	15.36
6½	1.04	36½	5.84	66½	10.64	96½	15.44
7	1.12	37	5.92	67	10.72	97	15.52
7½	1.20	37½	6.00	67½	10.80	97½	15.60
8	1.28	38	6.08	68	10.88	98	15.68
8½	1.36	38½	6.16	68½	10.96	98½	15.76
9	1.44	39	6.24	69	11.04	99	15.84
9½	1.52	39½	6.32	69½	11.12	99½	15.92
10	1.60	40	6.40	70	11.20	100	16.00
10½	1.68	40½	6.48	70½	11.28	100½	16.08
11	1.76	41	6.56	71	11.36	101	16.16
11½	1.84	41½	6.64	71½	11.44	101½	16.24
12	1.92	42	6.72	72	11.52	102	16.32
12½	2.00	42½	6.80	72½	11.60	102½	16.40
13	2.08	43	6.88	73	11.68	103	16.48
13½	2.16	43½	6.96	73½	11.76	103½	16.56
14	2.24	44	7.04	74	11.84	104	16.64
14½	2.32	44½	7.12	74½	11.92	104½	16.72
15	2.40	45	7.20	75	12.00	105	16.80
15½	2.48	45½	7.28	75½	12.08	105½	16.88
16	2.56	46	7.36	76	12.16	106	16.96
16½	2.64	46½	7.44	76½	12.24	106½	17.04
17	2.72	47	7.52	77	12.32	107	17.12
17½	2.80	47½	7.60	77½	12.40	107½	17.20
18	2.88	48	7.68	78	12.48	108	17.28
18½	2.96	48½	7.76	78½	12.56	108½	17.36
19	3.04	49	7.84	79	12.64	109	17.44
19½	3.12	49½	7.92	79½	12.72	109½	17.52
20	3.20	50	8.00	80	12.80	110	17.60
20½	3.28	50½	8.08	80½	12.88	110½	17.68
21	3.36	51	8.16	81	12.96	111	17.76
21½	3.44	51½	8.24	81½	13.04	111½	17.84
22	3.52	52	8.32	82	13.12	112	17.92
22½	3.60	52½	8.40	82½	13.20	112½	18.00
23	3.68	53	8.48	83	13.28	113	18.08
23½	3.76	53½	8.56	83½	13.36	113½	18.16
24	3.84	54	8.64	84	13.44	114	18.24
24½	3.92	54½	8.72	84½	13.52	114½	18.32
25	4.00	55	8.80	85	13.60	115	18.40
25½	4.08	55½	8.88	85½	13.68	115½	18.48
26	4.16	56	8.96	86	13.76	116	18.56
26½	4.24	56½	9.04	86½	13.84	116½	18.64
27	4.32	57	9.12	87	13.92	117	18.72
27½	4.40	57½	9.20	87½	14.00	117½	18.80
28	4.48	58	9.28	88	14.08	118	18.88
28½	4.56	58½	9.36	88½	14.16	118½	18.96
29	4.64	59	9.44	89	14.24	119	19.04
29½	4.72	59½	9.52	89½	14.32	119½	19.12
30	4.80	60	9.60	90	14.40	120	19.20

AT 16½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	5.03	60½	9.98	90½	14.93
		31	5.11	61	10.06	91	15.01
		31½	5.20	61½	10.15	91½	15.10
2	0.33	32	5.28	62	10.23	92	15.18
2½	0.41	32½	5.36	62½	10.31	92½	15.26
3	0.49	33	5.44	63	10.39	93	15.34
3½	0.58	33½	5.53	63½	10.48	93½	15.43
4	0.66	34	5.61	64	10.56	94	15.51
4½	0.74	34½	5.69	64½	10.64	94½	15.59
5	0.82	35	5.77	65	10.72	95	15.67
5½	0.91	35½	5.86	65½	10.81	95½	15.76
6	0.99	36	5.94	66	10.89	96	15.84
6½	1.07	36½	6.02	66½	10.97	96½	15.92
7	1.15	37	6.10	67	11.05	97	16.00
7½	1.24	37½	6.19	67½	11.14	97½	16.09
8	1.32	38	6.27	68	11.22	98	16.17
8½	1.40	38½	6.35	68½	11.30	98½	16.25
9	1.48	39	6.43	69	11.38	99	16.33
9½	1.57	39½	6.52	69½	11.47	99½	16.42
10	1.65	40	6.60	70	11.55	100	16.50
10½	1.73	40½	6.68	70½	11.63	100½	16.58
11	1.81	41	6.76	71	11.71	101	16.66
11½	1.90	41½	6.85	71½	11.80	101½	16.75
12	1.98	42	6.93	72	11.88	102	16.83
12½	2.06	42½	7.01	72½	11.96	102½	16.91
13	2.14	43	7.09	73	12.04	103	16.99
13½	2.23	43½	7.18	73½	12.13	103½	17.08
14	2.31	44	7.26	74	12.21	104	17.16
14½	2.39	44½	7.34	74½	12.29	104½	17.24
15	2.47	45	7.42	75	12.37	105	17.32
15½	2.56	45½	7.51	75½	12.46	105½	17.41
16	2.64	46	7.59	76	12.54	106	17.49
16½	2.72	46½	7.67	76½	12.62	106½	17.57
17	2.80	47	7.75	77	12.70	107	17.65
17½	2.89	47½	7.84	77½	12.79	107½	17.74
18	2.97	48	7.92	78	12.87	108	17.82
18½	3.05	48½	8.00	78½	12.95	108½	17.90
19	3.13	49	8.08	79	13.03	109	17.98
19½	3.22	49½	8.17	79½	13.12	109½	18.07
20	3.30	50	8.25	80	13.20	110	18.15
20½	3.38	50½	8.33	80½	13.28	110½	18.23
21	3.46	51	8.41	81	13.36	111	18.31
21½	3.55	51½	8.50	81½	13.45	111½	18.40
22	3.63	52	8.58	82	13.53	112	18.48
22½	3.71	52½	8.66	82½	13.61	112½	18 56
23	3.79	53	8.74	83	13.69	113	18.64
23½	3.88	53½	8.83	83½	13.78	113½	18.73
24	3.96	54	8.91	84	13.86	114	18.81
24½	4.04	54½	8.99	84½	13.94	114½	18.89
25	4.12	55	9.07	85	14.02	115	18.97
25½	4.21	55½	9.16	85½	14.11	115½	19.06
26	4.29	56	9.24	86	14.19	116	19.14
26½	4.37	56½	9.32	86½	14.27	116½	19.22
27	4.45	57	9.40	87	14.35	117	19.30
27½	4.54	57½	9.49	87½	14.44	117½	19.39
28	4.62	58	9.57	88	14.52	118	19.47
28½	4.70	58½	9.65	88½	14.60	118½	19.55
29	4.78	59	9.73	89	14.68	119	19.63
29½	4.87	59½	9.82	89½	14.77	119½	19.72
30	4.95	60	9.90	90	14.85	120	19.80

AT 17 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	5.18	60½	10.28	90½	15.38
		31	5.27	61	10.37	91	15.47
		31½	5.35	61½	10.45	91½	15.55
2	0.34	32	5.44	62	10.54	92	15.64
2½	0.42	32½	5.52	62½	10.62	92½	15.72
3	0.51	33	5.61	63	10.71	93	15.81
3½	0.59	33½	5.69	63½	10.79	93½	15.89
4	0.68	34	5.78	64	10.88	94	15.98
4½	0.76	34½	5.86	64½	10.96	94½	16.06
5	0.85	35	5.95	65	11.05	95	16.15
5½	0.93	35½	6.03	65½	11.13	95½	16.23
6	1.02	36	6.12	66	11.22	96	16.32
6½	1.10	36½	6.20	66½	11.30	96½	16.40
7	1.19	37	6.29	67	11.39	97	16.49
7½	1.27	37½	6.37	67½	11.47	97½	16.57
8	1.36	38	6.46	68	11.56	98	16.66
8½	1.44	38½	6.54	68½	11.64	98½	16.74
9	1.53	39	6.63	69	11.73	99	16.83
9½	1.61	39½	6.71	69½	11.81	99½	16.91
10	1.70	40	6.80	70	11.90	100	17.00
10½	1.78	40½	6.88	70½	11.98	100½	17.08
11	1.87	41	6.97	71	12.07	101	17.17
11½	1.95	41½	7.05	71½	12.15	101½	17.25
12	2.04	42	7.14	72	12.24	102	17.34
12½	2.12	42½	7.22	72½	12.32	102½	17.42
13	2.21	43	7.31	73	12.41	103	17.51
13½	2.29	43½	7.39	73½	12.49	103½	17.59
14	2.38	44	7.48	74	12.58	104	17.68
14½	2.46	44½	7.56	74½	12.66	104½	17.76
15	2.55	45	7.65	75	12.75	105	17.85
15½	2.63	45½	7.73	75½	12.83	105½	17.93
16	2.72	46	7.82	76	12.92	106	18.02
16½	2.80	46½	7.90	76½	13.00	106½	18.10
17	2.89	47	7.99	77	13.09	107	18.19
17½	2.97	47½	8.07	77½	13.17	107½	18.27
18	3.06	48	8.16	78	13.26	108	18.36
18½	3.14	48½	8.24	78½	13.34	108½	18.44
19	3.23	49	8.33	79	13.43	109	18.53
19½	3.31	49½	8.41	79½	13.51	109½	18.61
20	3.40	50	8.50	80	13.60	110	18.70
20½	3.48	50½	8.58	80½	13.68	110½	18.78
21	3.57	51	8.67	81	13.77	111	18.87
21½	3.65	51½	8.75	81½	13.85	111½	18.95
22	3.74	52	8.84	82	13.94	112	19.04
22½	3.82	52½	8.92	82½	14.02	112½	19.12
23	3.91	53	9.01	83	14.11	113	19.21
23½	3.99	53½	9.09	83½	14.19	113½	19.29
24	4.08	54	9.18	84	14.28	114	19.38
24½	4.16	54½	9.26	84½	14.36	114½	19.46
25	4.25	55	9.35	85	14.45	115	19.55
25½	4.33	55½	9.43	85½	14.53	115½	19.63
26	4.42	56	9.52	86	14.62	116	19.72
26½	4.50	56½	9.60	86½	14.70	116½	19.80
27	4.59	57	9.69	87	14.79	117	19.89
27½	4.67	57½	9.77	87½	14.87	117½	19.97
28	4.76	58	9.86	88	14.96	118	20.06
28½	4.84	58½	9.94	88½	15.04	118½	20.14
29	4.93	59	10.03	89	15.13	119	20.23
29½	5.01	59½	10.11	89½	15.21	119½	20.31
30	5.10	60	10.20	90	15.30	120	20.40

AT 17½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	5.34	60½	10.59	90½	15.84
		31	5.42	61	10.67	91	15.92
		31½	5.51	61½	10.76	91½	16.01
2	0.35	32	5.60	62	10.85	92	16.10
2½	0.44	32½	5.69	62½	10.94	92½	16.19
3	0.52	33	5.77	63	11.02	93	16.27
3½	0.61	33½	5.86	63½	11.11	93½	16.36
4	0.70	34	5.95	64	11.20	94	16.45
4½	0.79	34½	6.04	64½	11.29	94½	16.54
5	0.87	35	6.12	65	11.37	95	16.62
5½	0.96	35½	6.21	65½	11.46	95½	16.71
6	1.05	36	6.30	66	11.55	96	16.80
6½	1.14	36½	6.39	66½	11.64	96½	16.89
7	1.22	37	6.47	67	11.72	97	16.97
7½	1.31	37½	6.56	67½	11.81	97½	17.06
8	1.40	38	6.65	68	11.90	98	17.15
8½	1.49	38½	6.74	68½	11.99	98½	17.24
9	1.57	39	6.82	69	12.07	99	17.32
9½	1.66	39½	6.91	69½	12.16	99½	17.41
10	1.75	40	7.00	70	12.25	100	17.50
10½	1.84	40½	7.09	70½	12.34	100½	17.59
11	1.92	41	7.17	71	12.42	101	17.67
11½	2.01	41½	7.26	71½	12.51	101½	17.76
12	2.10	42	7 35	72	12.60	102	17.85
12½	2.19	42½	7.44	72½	12.69	102½	17.94
13	2.27	43	7.52	73	12.77	103	18.02
13½	2.36	43½	7.61	73½	12.86	103½	18.11
14	2.45	44	7.70	74	12.95	104	18.20
14½	2.54	44½	7.79	74½	13.04	104½	18.29
15	2.62	45	7.87	75	13.12	105	18.37
15½	2.71	45½	7.96	75½	13.21	105½	18.46
16	2.80	46	8.05	76	13.30	106	18.55
16½	2.89	46½	8.14	76½	13.39	106½	18.64
17	2.97	47	8.22	77	13.47	107	18.72
17½	3.06	47½	8.31	77½	13.56	107½	18.81
18	3.15	48	8.40	78	13.65	108	18.90
18½	3.24	48½	8.49	78½	13.74	108½	18.99
19	3 32	49	8.57	79	13.82	109	19.07
19½	3.41	49½	8.66	79½	13.91	109½	19.16
20	3.50	50	8.75	80	14.00	110	19.25
20½	3.59	50½	8.84	80½	14.09	110½	19.34
21	3.67	51	8.92	81	14.17	111	19.42
21½	3.76	51½	9.01	81½	14.26	111½	19.51
22	3.85	52	9.10	82	14.35	112	19.60
22½	3.94	52½	9.19	82½	14.44	112½	19.69
23	4.02	53	9.27	83	14.52	113	19.77
23½	4.11	53½	9.36	83½	14.61	113½	19.86
24	4.20	54	9.45	84	14.70	114	19.95
24½	4.29	54	9.54	84½	14.79	114½	20.04
25	4.37	55	9.62	85	14.87	115	20.12
25½	4.46	55½	9.71	85½	14.96	115½	20.21
26	4.55	56	9.80	86	15.05	116	20.30
26½	4.64	56½	9 89	86½	15.14	116½	20.39
27	4.72	57	9.97	87	15.22	117	20.47
27½	4.81	57½	10.06	87½	15.31	117½	20.56
28	4.90	58	10.15	88	15.40	118	20.65
28½	4.99	58½	10.24	88½	15.49	118½	20.74
29	5.07	59	10.32	89	15.57	119	20.82
29½	5.16	59½	10.41	89½	15.66	119½	20.91
30	5.25	60	10.50	90	15.75	120	21.00

AT 18 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	5.49	60½	10.89	90½	16.29
		31	5.58	61	10.98	91	16.38
		31½	5.67	61½	11.07	91½	16.47
2	0.36	32	5.76	62	11.16	92	16.56
2½	0.45	32½	5.85	62½	11.25	92½	16.65
3	0.54	33	5.94	63	11.34	93	16.74
3½	0.63	33½	6.03	63½	11.43	93½	16.83
4	0.72	34	6.12	64	11.52	94	16.92
4½	0.81	34½	6.21	64½	11.61	94½	17.01
5	0.90	35	6.30	65	11.70	95	17.10
5½	0.99	35½	6.39	65½	11.79	95½	17.19
6	1.08	36	6.48	66	11.88	96	17.28
6½	1.17	36½	6.57	66½	11.97	96½	17.37
7	1.26	37	6.66	67	12.06	97	17.46
7½	1.35	37½	6.75	67½	12.15	97½	17.55
8	1.44	38	6.84	68	12.24	98	17.64
8½	1.53	38½	6.93	68½	12.33	98½	17.73
9	1.62	39	7.02	69	12.42	99	17.82
9½	1.71	39½	7.11	69½	12.51	99½	17.91
10	1.80	40	7.20	70	12.60	100	18.00
10½	1.89	40½	7.29	70½	12.69	100½	18.09
11	1.98	41	7.38	71	12.78	101	18.18
11½	2.07	41½	7.47	71½	12.87	101½	18.27
12	2.16	42	7.56	72	12.96	102	18.36
12½	2.25	42½	7.65	72½	13.05	102½	18.45
13	2.34	43	7.74	73	13.14	103	18.54
13½	2.43	43½	7.83	73½	13.23	103½	18.63
14	2.52	44	7.92	74	13.32	104	18.72
14½	2.61	44½	8.01	74½	13.41	104½	18.81
15	2.70	45	8.10	75	13.50	105	18.90
15½	2.79	45½	8.19	75½	13.59	105½	18.99
16	2.88	46	8.28	76	13.68	106	19.08
16½	2.97	46½	8.37	76½	13.77	106½	19.17
17	3.06	47	8.46	77	13.86	107	19.26
17½	3.15	47½	8.55	77½	13.95	107½	19.35
18	3.24	48	8.64	78	14.04	108	19.44
18½	3.33	48½	8.73	78½	14.13	108½	19.53
19	3.42	49	8.82	79	14.22	109	19.62
19½	3.51	49½	8.91	79½	14.31	109½	19.71
20	3.60	50	9.00	80	14.40	110	19.80
20½	3.69	50½	9.09	80½	14.49	110½	19.89
21	3.78	51	9.18	81	14.58	111	19.98
21½	3.87	51½	9.27	81½	14.67	111½	20.07
22	3.96	52	9.36	82	14.76	112	20.16
22½	4.05	52½	9.45	82½	14.85	112½	20.25
23	4.14	53	9.54	83	14.94	113	20.34
23½	4.23	53½	9.63	83½	15.03	113½	20.43
24	4.32	54	9.72	84	15.12	114	20.52
24½	4.41	54½	9.81	84½	15.21	114½	20.61
25	4.50	55	9.90	85	15.30	115	20.70
25½	4.59	55½	9.99	85½	15.39	115½	20.79
26	4.68	56	10.08	86	15.48	116	20.88
26½	4.77	56½	10.17	86½	15.57	116½	20.97
27	4.86	57	10.26	87	15.66	117	21.06
27½	4.95	57½	10.35	87½	15.75	117½	21.15
28	5.04	58	10.44	88	15.84	118	21.24
28½	5.13	58½	10.53	88½	15.93	118½	21.33
29	5.22	59	10.62	89	16.02	119	21.42
29½	5.31	59½	10.71	89½	16.11	119½	21.51
30	5.40	60	10.80	90	16.20	120	21.60

AT 18½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	5.64	60½	11.19	90½	16.74
		31	5.73	61	11.28	91	16.83
		31½	5.83	61½	11.38	91½	16.93
2	0.37	32	5.92	62	11.47	92	17.02
2½	0.46	32½	6.01	62½	11.56	92½	17.11
3	0.55	33	6.10	63	11.65	93	17.20
3½	0.65	33½	6.20	63½	11.75	93½	17.30
4	0.74	34	6.29	64	11.84	94	17.39
4½	0.83	34½	6.38	64½	11.93	94½	17.48
5	0.92	35	6.47	65	12.02	95	17.57
5½	1.02	35½	6.57	65½	12.12	95½	17.67
6	1.11	36	6.66	66	12.21	96	17.76
6½	1.20	36½	6.75	66½	12.30	96½	17.85
7	1.29	37	6.84	67	12.39	97	17.94
7½	1.39	37½	6.94	67½	12.49	97½	18.04
8	1.48	38	7.03	68	12.58	98	18.13
8½	1.57	38½	7.12	68½	12.67	98½	18.22
9	1.66	39	7.21	69	12.76	99	18.31
9½	1.76	39½	7.31	69½	12.86	99½	18.41
10	1.85	40	7.40	70	12.95	100	18.50
10½	1.94	40½	7.49	70½	13.04	100½	18.59
11	2.03	41	7.58	71	13.13	101	18.68
11½	2.13	41½	7.68	71½	13.23	101½	18.77
12	2.22	42	7.77	72	13.32	102	18.87
12½	2.31	42½	7.86	72½	13.41	102½	18.96
13	2.40	43	7.95	73	13.50	103	19.05
13½	2.50	43½	8.05	73½	13.60	103½	19.15
14	2.59	44	8.14	74	13.69	104	19.24
14½	2.68	44½	8.23	74½	13.78	104½	19.33
15	2.77	45	8.32	75	13.87	105	19.42
15½	2.87	45½	8.42	75½	13.97	105½	19.52
16	2.96	46	8.51	76	14.06	106	19.61
16½	3.05	46½	8.60	76½	14.15	106½	19.70
17	3.14	47	8.69	77	14.24	107	19.79
17½	3.24	47½	8.79	77½	14.34	107½	19.89
18	3.33	48	8.88	78	14.43	108	19.98
18½	3.42	48½	8.97	78½	14.52	108½	20.07
19	3.51	49	9.06	79	14.61	109	20.16
19½	3.61	49½	9.16	79½	14.71	109½	20.26
20	3.70	50	9.25	80	14.80	110	20.35
20½	3.79	50½	9.34	80½	14.89	110½	20.44
21	3.88	51	9.43	81	14.98	111	20.53
21½	3.98	51½	9.53	81½	15.08	111½	20.63
22	4.07	52	9.62	82	15.17	112	20.72
22½	4.16	52½	9.71	82½	15.26	112½	20.81
23	4.25	53	9.80	83	15.35	113	20.90
23½	4.35	53½	9.90	83½	15.45	113½	21.00
24	4.44	54	9.99	84	15.54	114	21.09
24½	4.53	54½	10.08	84½	15.63	114½	21.18
25	4.62	55	10.17	85	15.72	115	21.27
25½	4.72	55½	10.27	85½	15.82	115½	21.37
26	4.81	56	10.36	86	15.91	116	21.46
26½	4.90	56½	10.45	86½	16.00	116½	21.55
27	4.99	57	10.54	87	16.09	117	21.64
27½	5.09	57½	10.64	87½	16.19	117½	21.74
28	5.18	58	10.73	88	16.28	118	21.83
28½	5.27	58½	10.82	88½	16.37	118½	21.92
29	5.36	59	10.91	89	16.46	119	22.01
29½	5.46	59½	11.01	89½	16.56	119½	22.11
30	5.55	60	11.10	90	16.65	120	22.20

AT 19 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	5.79	60½	11.49	90½	17.19
		31	5.89	61	11.59	91	17.29
		31½	5.98	61½	11.68	91½	17.38
2	0.38	32	6.08	62	11.78	92	17.48
2½	0.47	32½	6.17	62½	11.87	92½	17.57
3	0.57	33	6.27	63	11.97	93	17.67
3½	0.66	33½	6.36	63½	12.06	93½	17.76
4	0.76	34	6.46	64	12.16	94	17.86
4½	0.85	34½	6.55	64½	12.25	94½	17.95
5	0.95	35	6.65	65	12.35	95	18.05
5½	1.04	35½	6.74	65½	12.44	95½	18.14
6	1.14	36	6.84	66	12.54	96	18.24
6½	1.23	36½	6 93	66½	12.63	96½	18.33
7	1.33	37	7.03	67	12.73	97	18.43
7½	1.42	37½	7.12	67½	12.82	97½	18.52
8	1.52	38	7.22	68	12.92	98	18.62
8½	1.61	38½	7.31	68½	13.01	98½	18.71
9	1.71	39	7.41	69	13.11	99	18.81
9½	1.80	39½	7.50	69½	13.20	99½	18.90
10	1.90	40	7.60	70	13.30	100	19.00
10½	1.99	40½	7.69	70½	13.39	100½	19.09
11	2.09	41	7.79	71	13.49	101	19.19
11½	2.18	41½	7.88	71½	13.58	101½	19.28
12	2.28	42	7.98	72	13.68	102	19.38
12½	2.37	42½	8.08	72½	13.77	102½	19.47
13	2.47	43	8.16	73	13.87	103	19.57
13½	2.56	43½	8.27	73½	13.96	103½	19.66
14	2.66	44	8 35	74	14.06	104	19.76
14½	2.75	44½	8.46	74½	14.15	104½	19.85
15	2.85	45	8.54	75	14.25	105	19.95
15½	2.94	45½	8.65	75½	14.34	105½	20.04
16	3.04	46	8.73	76	14.44	106	20.14
16½	3.13	46½	8.84	76½	14.53	106½	20.23
17	3.23	47	8.92	77	14.63	107	20.33
17½	3.32	47½	9.03	77½	14.72	107½	20.42
18	3.42	48	9.12	78	14.82	108	20.52
18½	3.51	48½	9.21	78½	14.91	108½	20.61
19	3.61	49	9.31	79	15.01	109	20.71
19½	3.70	49½	9.40	79½	15.10	109½	20.80
20	3.80	50	9.50	80	15.20	110	20.90
20½	3.89	50½	9.59	80½	15.29	110½	20.99
21	3.99	51	9.69	81	15.39	111	21.09
21½	4.08	51½	9.78	81½	15.48	111½	21.18
22	4.18	52	9.88	82	15.58	112	21.28
22½	4.27	52½	9.97	82½	15.67	112½	21.37
23	4.37	53	10 07	83	15.77	113	21.47
23½	4.46	53½	10.16	83½	15.86	113½	21.56
24	4.56	54	10.26	84	15.96	114	21.66
24½	4.65	54½	10.35	84½	16.05	114½	21.75
25	4.74	55	10.45	85	16.15	115	21.85
25½	4.84	55½	10.54	85½	16.24	115½	21.94
26	4.94	56	10.64	86	16.34	116	22.04
26½	5.03	56½	10.73	86½	16.43	116½	22.13
27	5.13	57	10.83	87	16.53	117	22.23
27½	5.22	57½	10.92	87½	16.62	117½	22.32
28	5.32	58	11.02	88	16.72	118	22.42
28½	5.41	58½	11 11	88½	16.81	118½	22.51
29	5.51	59	11.21	89	16.91	119	22.61
29½	5.60	59½	11.30	89½	17.00	119½	22.70
30	5.70	60	11.40	90	17.10	120	22.80

AT 19½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	5.95	60½	11.80	90½	17.65
		31	6.04	61	11.89	91	17.74
		31½	6.14	61½	11.99	91½	17.84
2	0.39	32	6.24	62	12.09	92	17.94
2½	0.49	32½	6.34	62½	12.19	92½	18.04
3	0.58	33	6.43	63	12.28	93	18.13
3½	0.68	33½	6.53	63½	12.38	93½	18.23
4	0.78	34	6.63	64	12.48	94	18.33
4½	0.88	34½	6.73	64½	12.58	94½	18.43
5	0.97	35	6.82	65	12.67	95	18.52
5½	1.07	35½	6.92	65½	12.77	95½	18.62
6	1.17	36	7.02	66	12.87	96	18.72
6½	1.27	36½	7.12	66½	12.97	96½	18.82
7	1.36	37	7.21	67	13.06	97	18.91
7½	1.46	37½	7.31	67½	13.16	97½	19.01
8	1.56	38	7.41	68	13.26	98	19.11
8½	1.66	38½	7.51	68½	13.36	98½	19.21
9	1.75	39	7.60	69	13.45	99	19.30
9½	1.85	39½	7.70	69½	13.55	99½	19.40
10	1.95	40	7.80	70	3.65	100	19.50
10½	2.05	40½	7.90	70½	13.75	100½	19.60
11	2.14	41	7.99	71	13.84	101	19.69
11½	2.24	41½	8.09	71½	13.94	101½	19.79
12	2.34	42	8.19	72	14.04	102	19.89
12½	2.44	42½	8.29	72½	14.14	102½	19.99
13	2.53	43	8.38	73	14.23	103	20.08
13½	2.63	43½	8.48	73½	14.33	103½	20.18
14	2.73	44	8.58	74	14.43	104	20.28
14½	2.83	44½	8.68	74½	14.53	104½	20.38
15	2.92	45	8.77	75	14.62	105	20.47
15½	3.02	45½	8.87	75½	14.72	105½	20.57
16	3.12	46	8.97	76	14.82	106	20.67
16½	3 22	46½	9.07	76½	14.92	106½	20.77
17	3.31	47	9.16	77	15.01	107	20.86
17½	3.41	47½	9.26	77½	15.11	107½	20.96
18	3.51	48	9.36	78	15.21	108	21.06
18½	3 61	48½	9.46	78½	15.31	108½	21.16
19	3.70	49	9.55	79	15.40	109	21.25
19½	3.80	49½	9.65	79½	15.50	109½	21.35
20	3.90	50	9.75	80	15.60	110	21 45
20½	4.00	50½	9.85	80½	15.70	110½	21.55
21	4.09	51	9.94	81	15.79	111	21.64
21½	4.19	51½	10.04	81½	15.89	111½	21.74
22	4.29	52	10.14	82	15.99	112	21.84
22½	4.39	52½	10.24	82½	16.09	112½	21.94
23	4.48	53	10.33	83	16.18	113	22.03
23½	4.58	53½	10.43	83½	16.28	113½	22.13
24	4.68	54	10.53	84	16.38	114	22.23
24½	4.78	54½	10.63	84½	16.48	114½	22.33
25	4.87	55	10.72	85	16.57	115	22.42
25½	4.97	55½	10.82	85½	16.67	115½	22.52
26	5.07	56	10.92	86	16.77	116	22.62
26½	5.17	56½	11.02	86½	16.87	116½	22.72
27	5.26	57	11.11	87	16.96	117	22.81
27½	5.36	57½	11.21	87½	17.06	117½	22.91
28	5.46	58	11.31	88	17.16	118	23.01
28½	5.56	58½	11.41	88½	17.26	118½	23.11
29	5.65	59	11.50	89	17.35	119	23 20
29½	5.75	59½	11.60	89½	17.45	119½	23.30
30	5.85	60	11.70	90	17.55	120	23.40

AT 20 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	6.10	60½	12.10	90½	18.10
		31	6.20	61	12.20	91	18.20
		31½	6.30	61½	12.30	91½	18.30
2	0.40	32	6.40	62	12.40	92	18.40
2½	0.50	32½	6.50	62½	12.50	92½	18.50
3	0.60	33	6.60	63	12.60	93	18.60
3½	0.70	33½	6.70	63½	12.70	93½	18.70
4	0.80	34	6.80	64	12.80	94	18.80
4½	0.90	34½	6.90	64½	12.90	94½	18.90
5	1.00	35	7.00	65	13.00	95	19.00
5½	1.10	35½	7.10	65½	13.10	95½	19.10
6	1.20	36	7.20	66	13.20	96	19.20
6½	1.30	36½	7.30	66½	13.30	96½	19.30
7	1.40	37	7.40	67	13.40	97	19.40
7½	1.50	37½	7.50	67½	13.50	97½	19.50
8	1.60	38	7.60	68	13.60	98	19.60
8½	1.70	38½	7.70	68½	13.70	98½	19.70
9	1.80	39	7.80	69	13.80	99	19.80
9½	1.90	39½	7.90	69½	13.90	99½	19.90
10	2.00	40	8.00	70	14.00	100	20.00
10½	2.10	40½	8.10	70½	14.10	100½	20.10
11	2.20	41	8.20	71	14.20	101	20.20
11½	2.30	41½	8.30	71½	14.30	101½	20.30
12	2.40	42	8.40	72	14.40	102	20.40
12½	2.50	42½	8.50	72½	14.50	102½	20.50
13	2.60	43	8.60	73	14.60	103	20.60
13½	2.70	43½	8.70	73½	14.70	103½	20.70
14	2.80	44	8.80	74	14.80	104	20.80
14½	2.90	44½	8.90	74½	14.90	104½	20.90
15	3.00	45	9.00	75	15.00	105	21.00
15½	3.10	45½	9.10	75½	15.10	105½	21.10
16	3.20	46	9.20	76	15.20	106	21.20
16½	3.30	46½	9.30	76½	15.30	106½	21.30
17	3.40	47	9.40	77	15.40	107	21.40
17½	3.50	47½	9.50	77½	15.50	107½	21.50
18	3.60	48	9.60	78	15.60	108	21.60
18½	3.70	48½	9.70	78½	15.70	108½	21.70
19	3.80	49	9.80	79	15.80	109	21.80
19½	3.90	49½	9.90	79½	15.90	109½	21.90
20	4.00	50	10.00	80	16.00	110	22.00
20½	4.10	50½	10.10	80½	16.10	110½	22.10
21	4.20	51	10.20	81	16.20	111	22.20
21½	4.30	51½	10.30	81½	16.30	111½	22.30
22	4.40	52	10.40	82	16.40	112	22.40
22½	4.50	52½	10.50	82½	16.50	112½	22.50
23	4.60	53	10.60	83	16.60	113	22.60
23½	4.70	53½	10.70	83½	16.70	113½	22.70
24	4.80	54	10.80	84	16.80	114	22.80
24½	4.90	54½	10.90	84½	16.90	114½	22.90
25	5.00	55	11.00	85	17.00	115	23.00
25½	5.10	55½	11.10	85½	17.10	115½	23.10
26	5.20	56	11.20	86	17.20	116	23.20
26½	5.30	56½	11.30	86½	17.30	116½	23.30
27	5.40	57	11.40	87	17.40	117	23.40
27½	5.50	57½	11.50	87½	17.50	117½	23.50
28	5.60	58	11.60	88	17.60	118	23.60
28½	5.70	58½	11.70	88½	17.70	118½	23.70
29	5.80	59	11.80	89	17.80	119	23.80
29½	5.90	59½	11.90	89½	17.90	119½	23.90
30	6.00	60	12.00	90	18.00	120	24.00

AT 20½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	6.25	60½	12.40	90½	18.55
		31	6.35	61	12.50	91	18.65
		31½	6.46	61½	12.61	91½	18.76
2	0.41	32	6.56	62	12.71	92	18.86
2½	0.51	32½	6.66	62½	12.81	92½	18.96
3	0.61	33	6.76	63	12.91	93	19.06
3½	0.72	33½	6.87	63½	13.02	93½	19.17
4	0.82	34	6.97	64	13.12	94	19.27
4½	0.92	34½	7.07	64½	13.22	94½	19.37
5	1.02	35	7.17	65	13.32	95	19.47
5½	1.13	35½	7.28	65½	13.43	95½	19.58
6	1.23	36	7.38	66	13.53	96	19.68
6½	1.33	36½	7.48	66½	13.63	96½	19.78
7	1.43	37	7.58	67	13.73	97	19.88
7½	1.54	37½	7.69	67½	13.84	97½	19.99
8	1.64	38	7.79	68	13.94	98	20.09
8½	1.74	38½	7.89	68½	14.04	98½	20.19
9	1.84	39	7.99	69	14.14	99	20.29
9½	1.95	39½	8.10	69½	14.25	99½	20.40
10	2.05	40	8.20	70	14.35	100	20.50
10½	2.15	40½	8.30	70½	14.45	100½	20.60
11	2.25	41	8.40	71	14.55	101	20.70
11½	2.36	41½	8.51	71½	14.66	101½	20.81
12	2.46	42	8.61	72	14.70	102	20.91
12½	2.56	42½	8.71	72½	14.86	102½	21.01
13	2.66	43	8.81	73	14.96	103	21.11
13½	2.77	43½	8.92	73½	15.07	103½	21.22
14	2.87	44	9.02	74	15.17	104	21.32
14½	2.97	44½	9.12	74½	15.27	104½	21.42
15	3.07	45	9.22	75	15.37	105	21.52
15½	3.18	45½	9.33	75½	15.48	105½	21.63
16	3.28	46	9.43	76	15.58	106	21.73
16½	3.38	46½	9.53	76½	15.68	106½	21.83
17	3.48	47	9.63	77	15.78	107	21.93
17½	3.59	47½	9.74	77½	15.89	107½	22.04
18	3.69	48	9.84	78	15.99	108	22.14
18½	3.79	48½	9.94	78½	16.09	108½	22.24
19	3.89	49	10.04	79	16.19	109	22.34
19½	4.00	49½	10.15	79½	16.30	109½	22.45
20	4.10	50	10.25	80	16.40	110	22.55
20½	4.20	50½	10.35	80½	16.50	110½	22.65
21	4.30	51	10.45	81	16.60	111	22.75
21½	4.41	51½	10.56	81½	16.71	111½	22.86
22	4.51	52	10.66	82	16.81	112	22.96
22½	4.61	52½	10.76	82½	16.91	112½	23.06
23	4.71	53	10.86	83	17.01	113	23.16
23½	4.82	53½	10.97	83½	17.12	113½	23.27
24	4.92	54	11.07	84	17.22	114	23.37
24½	5.02	54½	11.17	84½	17.32	114½	23.47
25	5.12	55	11.27	85	17.42	115	23.57
25½	5.23	55½	11.38	85½	17.53	115½	23.68
26	5.33	56	11.48	86	17.63	116	23.78
26½	5.43	56½	11.58	86½	17.73	116½	23.88
27	5.53	57	11.68	87	17.83	117	23.98
27½	5.64	57½	11.79	87½	17.94	117½	24.09
28	5.74	58	11.89	88	18.04	118	24.19
28½	5.84	58½	11.99	88½	18.14	118½	24.29
29	5.94	59	12.09	89	18.24	119	24.39
29½	6.05	59½	12.20	89½	18.35	119½	24.50
30	6.15	60	12.30	90	18.45	120	24.60

AT 21 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	6.40	60½	12.70	90½	19.00
		31	6.51	61	12.81	91	19.11
		31½	6.61	61½	12.91	91½	19.21
2	0.42	32	6.72	62	13.02	92	19.32
2½	0.52	32½	6.82	62½	13.12	92½	19.42
3	0.63	33	6 93	63	13.23	93	19.53
3½	0.73	33½	7.03	63½	13.33	93½	19.63
4	0.84	34	7.14	64	13.44	94	19.74
4½	0.94	34½	7.24	64½	13.54	94½	19.84
5	1.05	35	7.35	65	13.65	95	19.95
5½	1.15	35½	7.45	65½	13.75	95½	20.05
6	1.26	36	7.56	66	13.86	96	20.16
6½	1.36	36½	7.66	66½	14.96	96½	20.26
7	1.47	37	7.77	67	13.07	97	20.37
7½	1.57	37½	7.87	67½	14.17	97½	20.47
8	1.68	38	7.98	68	14.28	98	20.58
8½	1.78	38½	8.08	68½	14.38	98½	20.68
9	1.89	39	8.19	69	14.49	99	20.79
9½	1.99	39½	8.29	69½	14.59	99½	20.89
10	2.10	40	8.40	70	14.70	100	21.00
10½	2.20	40½	8.50	70½	14.80	100½	21.10
11	2.31	41	8.61	71	14.91	101	21.21
11½	2.41	41½	8.71	71½	15.01	101½	21.31
12	2.52	42	8.82	72	15.12	102	21.42
12½	2.62	42½	8.92	72½	15.22	102½	21.52
13	2.73	43	9.03	73	15.33	103	21.63
13½	2.83	43½	9.13	73½	15.43	103½	21.73
14	2.94	44	9.24	74	15.54	104	21.84
14½	3.04	44½	9.34	74½	15.64	104½	21.94
15	3.15	45	9.45	75	15.75	105	22.05
15½	3.25	45½	9.55	75½	15.85	105½	22.15
16	3.30	46	9.66	76	15.96	106	22.26
16½	3.46	46½	9.76	76½	16.06	106½	22.36
17	3.57	47	9.87	77	16.17	107	22.47
17½	3.67	47½	9.97	77½	16.27	107½	22.57
18	3.78	48	10 08	78	16.38	108	22.68
18½	3.88	48½	10.18	78½	16.48	108½	22.78
19	3.99	49	10.29	79	16.59	109	22.89
19½	4.09	49½	10.39	79½	16.69	109½	22.99
20	4 20	50	10.50	80	16.80	110	23.10
20½	4.30	50½	10.60	80½	16.90	110½	23.20
21	4.41	51	10.71	81	17.01	111	23.31
21½	4.51	51½	10.81	81½	17.11	111½	23.41
22	4.62	52	10.92	82	17.22	112	23.52
22½	4.72	52½	11.02	82½	17.32	112½	23.62
23	4.83	53	11.13	83	17.43	113	23.73
23½	4.93	53½	11.23	83½	17.53	113½	23 83
24	5.04	54	11.34	84	17.64	114	23.94
24½	5.14	54½	11.44	84½	17.74	114½	24.04
25	5.25	55	11.55	85	17.85	115	24.15
25½	5.35	55½	11.65	85½	17.95	115½	24.25
26	5.46	56	11.76	86	18.06	116	24.36
26½	5.56	56½	11.86	86½	18.16	116½	24.46
27	5.67	57	11.97	87	18.27	117	24.57
27½	5.77	57½	12.07	87½	18.37	117½	24.67
28	5 88	58	12.18	88	18.48	118	24.78
28½	5.98	58½	12.28	88½	18.58	118½	24.88
29	6.09	59	12.39	89	18.69	119	24.99
29½	6.19	59½	12.49	89½	18.79	119½	25.09
30	6.30	60	12.60	90	18.90	120	25.20

AT 21½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	6.56	60½	13.01	90½	19.46
		31	6.66	61	13.11	91	19.56
		31½	6.77	61½	13.22	91½	19.67
2	0.43	32	6.88	62	13.33	92	19.78
2½	0.54	32½	6.99	62½	13.44	92½	19.89
3	0.64	33	7.09	63	13.54	93	19.99
3½	0.75	33½	7.20	63½	13.65	93½	20.10
4	0.86	34	7.31	64	13.76	94	20.21
4½	0.97	34½	7.42	64½	13.87	94½	20.32
5	1.07	35	7.52	65	13.97	95	20.42
5½	1.18	35½	7.63	65½	14.08	95½	20.53
6	1.29	36	7.74	66	14.19	96	20.64
6½	1.40	36½	7.85	66½	14.30	96½	20.75
7	1.50	37	7.95	67	14.40	97	20.85
7½	1.61	37½	8.06	67½	14.51	97½	20.96
8	1.72	38	8.17	68	14.62	98	21.07
8½	1.83	38½	8.28	68½	14.73	98½	21.18
9	1.93	39	8.38	69	14.83	99	21.28
9½	2.04	39½	8.49	69½	14.94	99½	21.39
10	2.15	40	8.60	70	15.05	100	21.50
10½	2.26	40½	8.71	70½	15.16	100½	21.61
11	2.36	41	8.81	71	15.26	101	21.71
11½	2.47	41½	8.92	71½	15.37	101½	21.82
12	2.58	42	9.03	72	15.48	102	21.93
12½	2.69	42½	9.14	72½	15.59	102½	22.04
13	2.79	43	9.24	73	15.69	103	22.14
13½	2.90	43½	9.35	73½	15.80	103½	22.25
14	3.01	44	9.46	74	15.91	104	22.36
14½	3.12	44½	9.57	74½	16.02	104½	22.47
15	3.22	45	9.67	75	16.12	105	22.57
15½	3.33	45½	9.78	75½	16.23	105½	22.68
16	3.44	46	9.89	76	16.34	106	22.79
16½	3.55	46½	10.00	76½	16.45	106½	22.90
17	3.65	47	10.10	77	16.55	107	23.00
17½	3.76	47½	10.21	77½	16.66	107½	23.11
18	3.87	48	10.32	78	16.77	108	23.22
18½	3.98	48½	10.43	78½	16.88	108½	23.33
19	4.08	49	10.53	79	16.98	109	23.43
19½	4.19	49½	10.64	79½	17.09	109½	23.54
20	4.30	50	10.75	80	17.20	110	23.65
20½	4.41	50½	10.86	80½	17.31	110½	23.76
21	4.51	51	10.96	81	17.41	111	23.86
21½	4.62	51½	11.07	81½	17.52	111½	23.97
22	4.73	52	11.18	82	17.63	112	24.08
22½	4.84	52½	11.29	82½	17.74	112½	24.19
23	4.94	53	11.39	83	17.84	113	24.29
23½	5.05	53½	11.50	83½	17.95	113½	24.40
24	5.16	54	11.61	84	18.06	114	24 51
24½	5.27	54½	11.72	84½	18.17	114½	24.62
25	5.37	55	11.82	85	18.27	115	24.72
25½	5.48	55½	11.93	85½	18.38	115½	24.83
26	5.59	56	12.04	86	18.49	116	24.94
26½	5.70	56½	12.15	86½	18.60	116½	25.05
27	5.80	57	12.25	87	18.70	117	25.15
27½	5.91	57½	12.36	87½	18.81	117½	25.26
28	6.02	58	12.47	88	1 92	118	25.37
28½	6.13	58½	12.58	88½	19.03	118½	25.48
29	6.23	59	12.68	89	19.13	119	25.58
29½	6.34	59½	12.79	89½	19.24	119½	25.69
30	6.45	60	12.60	90	19.35	120	25.80

AT 22 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	6.71	60½	13.31	90½	19.91
		31	6.82	61	13.42	91	20.02
		31½	6.93	61½	13 53	91½	20. 13
2	0.44	32	7.04	62	13.64	92	20.24
2½	0.55	32½	7.15	62½	13.75	92½	20.35
3	0.66	33	7.26	63	13.86	93	20.46
3½	0.77	33½	7.37	63½	13.97	93½	20.57
4	0.88	34	7.48	64	14.08	94	20.68
4½	0.99	34½	7.59	64½	14.19	94½	20.79
5	1.10	35	7.70	65	14.30	95	20.90
5½	1.21	35½	7.81	65½	14.41	95½	21.01
6	1.32	36	7.92	66	14.52	96	21.12
6½	1.43	36½	8.03	66½	14.63	96½	21.23
7	1.54	37	8.14	67	14.74	97	21.34
7½	1.65	37½	8.25	67½	14.85	97½	21.45
8	1.76	38	8.36	68	14.96	98	21.56
8½	1.87	38½	8.47	68½	15.07	98½	21.67
9	1.98	39	8.58	69	15. 18	99	21.78
9½	2.09	39½	8.69	69½	15.29	99½	21.80
10	2.20	40	8.80	70	15.40	100	22.00
10½	2.31	40½	8.91	70½	15.51	100½	22.11
11	2.42	41	9.02	71	15.62	101	22.22
11½	2.53	41½	9.13	71½	15.73	101½	22.33
12	2.64	42	9.24	72	15 84	102	22.44
12½	2.75	42½	9.35	72½	15.95	102½	22.55
13	2.86	43	9.46	73	16.06	103	22.66
13½	2.97	43½	9.57	73½	16.17	103½	22.77
14	3.08	44	9.68	74	16.28	104	22.88
14½	3.19	44½	9.79	74½	16.39	104½	22.99
15	3.30	45	9.90	75	16.50	105	23.10
15½	3.41	45½	10.01	75½	16.61	105½	23.21
16	3.52	46	10.12	76	16.72	106	23.32
16½	3.63	46½	10.23	76½	16.83	106½	23.43
17	3.74	47	10.34	77	16.94	107	23.54
17½	3.85	47½	10.45	77½	17.05	107½	23.65
18	3.96	48	10.56	78	17.16	108	23.76
18½	4.07	48½	10.67	78½	17.27	108½	23.87
19	4.18	49	10.78	79	17.38	109	23.98
19½	4.29	49½	10.89	79½	17.49	109½	24.09
20	4.40	50	11.00	80	17.60	110	24.20
20½	4.51	50½	11.11	80½	17.71	110½	24.31
21	4.62	51	11.22	81	17.82	111	24.42
21½	4.73	51½	11.33	81½	17.93	111½	24.53
22	4.84	52	11.44	82	18.04	112	24.64
22½	4.95	52½	11.55	82½	18.15	112½	24.75
23	5.06	53	11.66	83	18.26	113	24.86
23½	5.17	53½	11.77	83½	18.37	113½	24.97
24	5.28	54	11.88	84	18.48	114	25.08
24½	5.39	54½	11.99	84½	18.59	114½	25.19
25	5.50	55	12.10	85	18.70	115	25.30
25½	5.61	55½	12.21	85½	18.81	115½	25.41
26	5.72	56	12.32	86	18.92	116	25.52
26½	5.83	56½	12.43	86½	19.03	116½	25.63
27	5.94	57	12.54	87	19.14	117	25.74
27½	6.05	57½	12.65	87½	19.25	117½	25.85
28	6.16	58	12.76	88	19.36	118	25.96
28½	6.27	58½	12.87	88½	19.47	118½	26.07
29	6.38	59	12.98	89	19.58	119	26.18
29½	6.49	59½	13.09	89½	19.69	119½	26.29
30	6.60	60	13.20	90	19.80	120	26.40

AT 22½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	6.86	60½	13.61	90½	20.36
		31	6.97	61	13.72	91	20.47
		31½	7.09	61½	13.84	91½	20.59
2	0.45	32	7.20	62	13.95	92	20.70
2½	0.56	32½	7 31	62½	14.06	92½	20.81
3	0.67	33	7.42	63	14.17	93	20.92
3½	0.79	33½	7.54	63½	14.29	93½	21.04
4	0.90	34	7.65	64	14.40	94	21.15
4½	1.01	34½	7.76	64½	14.51	94½	21.26
5	1.12	35	7.87	65	14.62	95	21.37
5½	1.24	35½	7.99	65½	14.74	95½	21.49
6	1.35	36	8.10	66	14.85	96	21.60
6½	1.46	36½	8.21	66½	14.96	96½	21.71
7	1.57	37	8.32	67	15.07	97	21.82
7½	1.69	37½	8.44	67½	15.19	97½	21.94
8	1.80	38	8.55	68	15.30	98	22.05
8½	1.91	38½	8.66	68½	15.41	98½	22.16
9	2.02	39	8.77	69	15.52	99	22.27
9½	2.14	39½	8.89	69½	15.64	99½	22.39
10	2.25	40	9.00	70	15.75	100	22.50
10½	2.36	40½	9.11	70½	15.86	100½	22.61
11	2.47	41	9.22	71	15.97	101	22.72
11½	2.59	41½	9.34	71½	16.09	101½	22.84
12	2.70	42	9.45	72	16.20	102	22.95
12½	2.81	42½	9.56	72½	16.31	102½	23.06
13	2.92	43	9.67	73	16.42	103	23.17
13½	3.04	43½	9.79	73½	16.54	103½	23.29
14	3.15	44	9 90	74	16.65	104	23.40
14½	3.26	44½	10.01	74½	16.76	104½	23.51
15	3.37	45	10.12	75	16.87	105	53.62
15½	3.49	45½	10.24	75½	16.99	105½	23.74
16	3.60	46	10.35	76	17.10	106	23.85
16½	3.71	46½	10.46	76½	17.21	106½	23.96
17	3.82	47	10.57	77	17.32	107	24.07
17½	3.94	47½	10.69	77½	17.44	107½	24.19
18	4.05	48	10.80	78	17.55	108	24.30
18½	4.16	48½	10.91	78½	17.66	108½	24.41
19	4.27	49	11.02	79	17.77	109	24.52
19½	4.39	49½	11.14	79½	17.89	109½	24.64
20	4.50	50	11.25	80	18.00	110	24.75
20½	4.61	50½	11.36	80½	18.11	110½	24.86
21	4.72	51	11.47	81	18.22	111	24.97
21½	4.84	51½	11.59	81½	18.34	111½	25.09
22	4.95	52	11.70	82	18.45	112	25.20
22½	5.06	52½	11.81	82½	18.56	112½	25.31
23	5.17	53	11.92	83	18.67	113	25 42
23½	5.29	53½	12.04	83½	18.79	113½	25.54
24	5.40	54	12.15	84	18.90	114	25.65
24½	5.51	54½	12.26	84½	19.01	114½	25.76
25	5.62	55	12.37	85	19.12	115	25.87
25½	5.74	55½	12.49	85½	19.24	115½	25.99
26	5.85	56	12.60	86	19.35	116	26.10
26½	5.96	56½	12.71	86½	19.46	116½	26.21
27	6.07	57	12.82	87	19.57	117	26.32
27½	6.19	57½	12.94	87½	19.69	117½	26.44
28	6.30	58	13.05	88	19.80	118	26.55
28½	6.41	58½	13.16	88½	19.91	118½	26.66
29	6.52	59	13.27	89	20.02	119	26.77
29½	6.64	59½	13.39	89½	20.14	119½	26.89
30	6.75	60	13.50	90	20.25	120	27.00

AT 23 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	7.01	60½	14.91	90½	20.81
		31	7.13	61	13.03	91	20.93
		31½	7.24	61½	14.14	91½	21.04
2	0.46	32	7.36	62	14.26	92	21.16
2½	0.57	32½	7.47	62½	14.37	92½	21.27
3	0.69	33	7.59	63	14.49	93	21.39
3½	0.80	33½	7.70	63½	14.60	93½	21.50
4	0.92	34	7.82	64	14.72	94	21.62
4½	1.03	34½	7.93	64½	14.83	94½	21.73
5	1.15	35	8.05	65	14.95	95	21.85
5½	1.26	35½	8.16	65½	15.06	95½	21.96
6	1.38	36	8.28	66	15.18	96	22.08
6½	1.49	36½	8.39	66½	15.29	96½	22.19
7	1.61	37	8.51	67	15.41	97	22.31
7½	1.72	37½	8.62	67½	15.52	97½	22.42
8	1.84	38	8.74	68	15.64	98	22.54
8½	1.95	38½	8.85	68½	15.75	98½	22.65
9	2.07	39	8.97	69	15.86	99	22.77
9½	2.18	39½	9.08	69½	15.97	99½	22.88
10	2.30	40	9.20	70	16.09	100	23.00
10½	2.41	40½	9.31	70½	16.20	100½	23.11
11	2.53	41	9.43	71	16.32	101	23.23
11½	2.64	41½	9.54	71½	16.43	101½	23.34
12	2.76	42	9.66	72	16.55	102	23.46
12½	2.87	42½	9.77	72½	16.66	102½	23.57
13	2.99	43	9.89	73	16.78	103	23.69
13½	3.10	43½	10 00	73½	16.90	103½	23.80
14	3.22	44	10.12	74	17.02	104	23.92
14½	3.33	44½	10.23	74½	17.13	104½	24.03
15	3.45	45	10.35	75	17.25	105	24.15
15½	3.56	45½	10.46	75½	17.36	105½	24.26
16	3.68	46	10.58	76	17.48	106	24.38
16½	3.79	46½	10.69	76½	17.59	106½	24.49
17	3.91	47	10.81	77	17.71	107	24.61
17½	4.02	47½	10.92	77½	17.82	107½	24.72
18	4.14	48	11.04	78	17.94	108	24.84
18½	4.25	48½	11.15	78½	18.05	108½	24.95
19	4.37	49	11.27	79	18.17	109	25.07
19½	4.48	49½	11.38	79½	18.28	109½	25.18
20	4.60	50	11.50	80	18.40	110	25.30
20½	4.71	50½	11.61	80½	18.51	110½	25.41
21	4.83	51	11.73	81	18.63	111	25.53
21½	4.94	51½	11.84	81½	18.74	111½	25.64
22	5.06	52	11.96	82	18.86	112	25.76
22½	5.17	52½	12.07	82½	18.07	112½	25.87
23	5.29	53	12.19	83	19.09	113	25.99
23½	5.40	53½	12.30	83½	19.20	113½	26.10
2	5.52	54	12.42	84	19.32	114	26.22
[illegible]2	5.63	54½	12.53	84½	19.43	114½	26.33
25	5.75	55	12.65	85	19.55	115	26.45
25½	5.86	55½	12.76	85½	19.66	115½	26.56
26	5.98	56	12.88	86	19.78	116	26.68
26½	6.09	56½	12.99	86½	19.89	116½	26.79
27	6.21	57	13.11	87	20.01	117	26.91
27½	6.32	57½	13.22	87½	20.12	117½	27.02
28	6.44	58	13.34	88	20.24	118	27.14
28½	6.55	58½	13.45	88½	20.35	118½	27.25
29	6.67	59	13.57	89	20.47	119	27.37
29½	6.78	59½	13.69	89½	20.58	119½	27.48
30	6.90	60	13.80	90	20.70	120	27.60

AT 23½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	7.17	60½	14.22	90½	21.27
		31	7.28	61	14.33	91	21.38
		31½	7.40	61½	14.45	91½	21.50
2	0.47	32	7.52	62	14.57	92	21.62
2½	0.59	32½	7.64	62½	14.69	92½	21.74
3	0.70	33	7.75	63	14.80	93	21.85
3½	0.82	33½	7.87	63½	14.92	93½	21.97
4	0.94	34	7.99	64	15.04	94	22.09
4½	1.06	34½	8.11	64½	15.16	94½	22.21
5	1.17	35	8.22	65	15.27	95	22.32
5½	1.29	35½	8.34	65½	15.39	95½	22.44
6	1.41	36	8.46	66	15.51	96	22 56
6½	1.53	36½	8.58	66½	15.63	96½	22.68
7	1.64	37	8.69	67	15.74	97	22.79
7½	1.76	37½	8.81	67½	15.86	97½	22.91
8	1.88	38	8.93	68	15.98	98	23.03
8½	2.00	38½	9.05	68½	16.10	98½	23.15
9	2.11	39	9.16	69	16.21	99	23 26
9½	2.23	39½	9.28	69½	16.33	99½	23.38
10	2.35	40	9.40	70	16.45	100	23.50
10½	2.47	40½	9.52	70½	16.57	100½	23.62
11	2.58	41	9.63	71	16.68	101	23.73
11½	2.70	41½	9.75	71½	16.80	101½	23.85
12	2.82	42	9.87	72	16.92	102	23.97
12½	2.94	42½	9.99	72½	17.04	102½	24.09
13	3.05	43	10.10	73	17.15	103	24 20
13½	3.17	43½	10.22	73½	17.27	103½	24.32
14	3.29	44	10.34	74	17.39	104	24.44
14½	3.41	44½	10.46	74½	17.51	104½	24 56
15	3.52	45	10.57	75	17.62	105	24.67
15½	3.64	45½	10.69	75½	17.74	105½	24.79
16	3.76	46	10.81	76	17.86	106	24.91
16½	3.88	46½	10.93	76½	17.98	106½	25.03
17	3.99	47	11.04	77	18.09	107	25.14
17½	4.11	47½	11.16	77½	18.21	107½	25 26
18	4.23	48	11.28	78	18.33	108	25.38
18½	4.35	48½	11.40	78½	18.45	108½	25.50
19	4.46	49	11.51	79	18.56	109	25.61
19½	4.58	49½	11 63	79½	18.68	109½	25.73
20	4.70	50	11.75	80	18.80	110	25.85
20½	4.82	50½	11.87	80½	18.92	110½	25.97
21	4.93	51	11.98	81	19.03	111	26.08
21½	5.05	51½	12.10	81½	19.15	111½	26.20
22	5.17	52	12.22	82	19.27	112	26.32
22½	5.29	52½	12.34	82½	19.39	112½	26.44
23	5.40	53	12.45	83	19.50	113	26.55
23½	5.52	53½	12.57	83½	19.62	113½	26.67
24	5.64	54	12.69	84	19.74	114	26.79
24½	5.76	54½	12.81	84½	19.86	114½	26.91
25	5.87	55	12.92	85	19.97	115	27.02
25½	5.99	55½	13.04	85½	20.09	115½	27.14
26	6.11	56	13.16	86	20.21	116	27.26
26½	6.23	56½	13.28	86½	20.33	116½	27.38
27	6.34	57	13.39	87	20.44	117	27.49
27½	6.46	57½	13.51	87½	20.56	117½	27.61
28	6.58	58	13.63	88	20.68	118	27.73
28½	6.70	58½	13.75	88½	20.80	118½	27.85
29	6.81	59	13.86	89	20.91	119	27.99
29½	6.93	59½	13.98	89½	21.03	119½	28.08
30	7.05	60	14.10	90	21.15	120	28.20

AT 24 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	7.32	60½	14.52	90½	21.72
		31	7.44	61	14.64	91	21.84
		31½	7.56	61½	14.76	91½	21.96
2	0.48	32	7.68	62	14.88	92	22.08
2½	0.60	32½	7.80	62½	15.00	92½	22.20
3	0.72	33	7.92	63	15.12	93	22.32
3½	0.84	33½	8.04	63½	15.24	93½	22.44
4	0.96	34	8.16	64	15.36	94	22.56
4½	1.08	34½	8.28	64½	15.48	94½	22.68
5	1.20	35	8.40	65	15.60	95	22.80
5½	1.32	35½	8.52	65½	15.72	95½	22.92
6	1.44	36	8.64	66	15.84	96	23.04
6½	1.56	36½	8.76	66½	15.96	96½	23.16
7	1.68	37	8.88	67	16.08	97	23.28
7½	1.80	37½	9.00	67½	16.20	97½	23.40
8	1.92	38	9.12	68	16.32	98	23.52
8½	2.04	38½	9.24	68½	16.44	98½	23.64
9	2.16	39	9.36	69	16.56	99	23.76
9½	2.28	39½	9.48	69½	16.68	99½	23.88
10	2.40	40	9.60	70	16.80	100	24.00
10½	2.52	40½	9.72	70½	16.92	100½	24.12
11	2.64	41	9.84	71	17.04	101	24.24
11½	2.76	41½	9.96	71½	17.16	101½	24.36
12	2.88	42	10.08	72	17.28	102	24.48
12½	3.00	42½	10.20	72½	17.40	102½	24.60
13	3.12	43	10.32	73	17.52	103	24.72
13½	3.24	43½	10.44	73½	17.64	103½	24.84
14	3.36	44	10.56	74	17.76	104	24.96
14½	3.48	44½	10.68	74½	17.88	104½	25.08
15	3.60	45	10.80	75	18.00	105	25.20
15½	3.72	45½	10.92	75½	18.12	105½	25.32
16	3.84	46	11.04	76	18.24	106	25.44
16½	3.96	46½	11.16	76½	18.36	106½	25.56
17	4.08	47	11.28	77	18.48	107	25.68
17½	4.20	47½	11.40	77½	18.60	107½	25.80
18	4.32	48	11.52	78	18.72	108	25.92
18½	4.44	48½	11.64	78½	18.84	108½	25.04
19	4.56	49	11.76	79	18.96	109	26.16
19½	4.68	49½	11.88	79½	19.08	109½	26.28
20	4.80	50	12.00	80	19.20	110	26.40
20½	4.92	50½	12.12	80½	19.32	110½	26.52
21	5.04	51	12.24	81	19.44	111	26.64
21½	5.16	51½	12.36	81½	19.56	111½	26.76
22	5.28	52	12.48	82	19.68	112	26.88
22½	5.40	52½	12.60	82½	19.80	112½	27.00
23	5.52	53	12.72	83	19.92	113	27.12
23½	5.64	53½	12.84	83½	20.04	113½	27.24
24	5.76	54	12.96	84	20.16	114	27.36
24½	5.88	54½	13.08	84½	20.28	114½	27.48
25	6.00	55	13.20	85	20.40	115	27.60
25½	6.12	55½	13.32	85½	20.52	115½	27.72
26	6.24	56	13.44	86	20.64	116	27.84
26½	6.36	56½	13.56	86½	20.76	116½	27.96
27	6.48	57	13.68	87	20.88	117	28.08
27½	6.60	57½	13.80	87½	21.00	117½	28.20
28	6.72	58	13.92	88	21.12	118	28.32
28½	6.84	58½	14.04	88½	21.24	118½	28.44
29	6.96	59	14.16	89	21.36	119	28.56
29½	7.08	59½	14.28	89½	21.48	119½	28.68
30	7.20	60	14.40	90	21.60	120	28.80

AT 24½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	7.47	60½	14.82	90½	22.17
		31	7.59	61	14.94	91	22.29
		31½	7.72	61½	15.07	91½	22.42
2	0.49	32	7.84	62	15.19	92	22.54
2½	0.61	32½	7.96	62½	15.31	92½	22.66
3	0.73	33	8.08	63	15.43	93	22.78
3½	0.86	33½	8.21	63½	15.56	93½	22.91
4	0.98	34	8.33	64	15.68	94	23.03
4½	1.10	34½	8.45	64½	15.80	94½	23.15
5	1.22	35	8.57	65	15.92	95	23.27
5½	1.35	35½	8.70	65½	16.05	95½	23.40
6	1.47	36	8.82	66	16.17	96	23.52
6½	1.59	36½	8.94	66½	16.29	96½	23.64
7	1.71	37	9.06	67	16.41	97	23.76
7½	1.84	37½	9.19	67½	16.54	97½	23.89
8	1.96	38	9.31	68	16.66	98	24.01
8½	2.08	38½	9.43	68½	16.78	98½	24.13
9	2.20	39	9.55	69	16.90	99	24.25
9½	2.33	39½	9.68	69½	17.03	99½	24.38
10	2.45	40	9.80	70	17.15	100	24.50
10½	2.57	40½	9.92	70½	17.27	100½	24.62
11	2.69	41	10.04	71	17.39	101	24.74
11½	2.82	41½	10.17	71½	17.52	101½	24.87
12	2.94	42	10.29	72	17.64	102	24.99
12½	3.06	42½	10.41	72½	17.76	102½	25.11
13	3.18	43	10.53	73	17.88	103	25.23
13½	3.31	43½	10.66	73½	18.01	103½	25.36
14	3.43	44	10.78	74	18.13	104	25.48
14½	3.55	44½	10.90	74½	18.25	104½	25.60
15	3.67	45	11.02	75	18.37	105	25.72
15½	3.80	45½	11.15	75½	18.50	105½	25.85
16	3.92	46	11.27	76	18.62	106	25.97
16½	4.04	46½	11.39	76½	18.74	106½	26.09
17	4.16	47	11.51	77	18.86	107	26.21
17½	4.29	47½	11.64	77½	18.99	107½	26.34
18	4.41	48	11.76	78	19.11	108	26.46
18½	4.53	48½	11.88	78½	19.23	108½	26.58
19	4.65	49	12.00	79	19.35	109	26.70
19½	4.78	49½	12.13	79½	19.48	109½	26.83
20	4.90	50	12.25	80	19.60	110	26.95
20½	5.02	50½	12.37	80½	19.72	110½	27.07
21	5.14	51	12.49	81	19.84	111	27.19
21½	5.27	51½	12.62	81½	19.97	111½	27.32
22	5.39	52	12.74	82	20.09	112	27.44
22½	5.51	52½	12.86	82½	20.21	112½	27.56
23	5.63	53	12.98	83	20.33	113	27.68
23½	5.76	53½	13.11	83½	20.46	113½	27.81
24	5.88	54	13.23	84	20.58	114	27.93
24½	6.00	54½	13.35	84½	20.70	114½	28.05
25	6.12	55	13.47	85	20.82	115	28.17
25½	6.25	55½	13 60	85½	20.95	115½	28.30
26	6.37	56	13 72	86	21.07	116	28.42
26½	6.49	56½	13.84	86½	21.19	116½	28.54
27	6.61	57	13.96	87	21.31	117	28.66
27½	6.74	57½	14.09	87½	21.44	117½	28.79
28	6.86	58	14.21	88	21.56	118	28.91
28½	6.98	58½	14.33	88½	21.68	118½	29.03
29	7.10	59	14.45	89	21.80	119	29.15
29½	7.23	59½	14.58	89½	21.93	119½	29.28
30	7 35	60	14.70	90	22.05	120	29.40

AT 25 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	7.62	60½	15.12	90½	22.62
		31	7.75	61	15.25	91	22.75
		31½	7.87	61½	15.37	91½	22.87
2	0.50	32	8.00	62	15.50	92	23.00
2½	0.62	32½	8.12	62½	15.62	92½	23.12
3	0.75	33	8.25	63	15.75	93	23.25
3½	0.87	33½	8.37	63½	15.87	93½	23.37
4	1.00	34	8.50	64	16.00	94	23.50
4½	1.12	34½	8.62	64½	16.12	94½	23.62
5	1.25	35	8.75	65	16.25	95	23.75
5½	1.37	35½	8.87	65½	16.37	95½	23.87
6	1.50	36	9.00	66	16.50	96	24.00
6½	1.62	36½	9.12	66½	16.62	96½	24.12
7	1.75	37	9.25	67	16.75	97	24.25
7½	1.87	37½	9.37	67½	16.87	97½	24.37
8	2.00	38	9.50	68	17.00	98	24.50
8½	2.12	38½	9.62	68½	17.12	98½	24.62
9	2.25	39	9.75	69	17.25	99	24.75
9½	2.37	39½	9.87	69½	17.37	99½	24.87
10	2.50	40	10 00	70	17.50	100	25.00
10½	2.62	40½	10.12	70½	17.62	100½	25.12
11	2.75	41	10.25	71	17.75	101	25.25
11½	2.87	41½	10.37	71½	17.87	101½	25.37
12	3.00	42	10.50	72	18.00	102	25.50
12½	3.12	42½	10.62	72½	18.12	102½	25.62
13	3.25	43	10.75	73	18.25	103	25.75
13½	3.37	43½	10.87	73½	18.37	103½	25.87
14	3.50	44	11.00	74	18.50	104	26.00
14½	3.62	44½	11.12	74½	18.62	104½	26.12
15	3.75	45	11.25	75	18.75	105	26.25
15½	3.87	45½	11.37	75½	18.87	105½	26.37
16	4.00	46	11.50	76	19.00	106	26.50
16½	4.12	46½	11.62	76½	19.12	106½	26.62
17	4.25	47	11.75	77	19.25	107	26.75
17½	4.37	47½	11.87	77½	19.37	107½	26.87
18	4.50	48	12.00	78	19.50	108	27.00
18½	4.62	48½	12.12	78½	19.62	108½	27.12
19	4.75	49	12.25	79	19.75	109	27.25
19½	4.87	49½	12.37	79½	19.87	109½	27.37
20	5.00	50	12.50	80	20 00	110	27.50
20½	5.12	50½	12.62	80½	20.12	110½	27.62
21	5.25	51	12.75	81	20.25	111	27.75
21½	5.37	51½	12.87	81½	20.37	111½	27.87
22	5.50	52	13.00	82	20.50	112	28.00
22½	5.62	52½	13.12	82½	20.62	112½	28.12
23	5.75	53	13.25	83	20.75	113	28.25
23½	5.87	53½	13.37	83½	20.87	113½	28.37
24	6.00	54	13.50	84	21.00	114	28.50
24½	6.12	54½	13.62	84½	21.12	114½	28.62
25	6.25	55	13.75	85	21.25	115	28.75
25½	6.37	55½	13.87	85½	21.37	115½	28.87
26	6.50	56	14.00	86	21.50	116	29,00
26½	6.62	56½	14.12	86½	21.62	116½	29.12
27	6.75	57	14.25	87	21.75	117	29.25
27½	6.87	57½	14.37	87½	21.87	117½	29.37
28	7.00	58	14.50	88	22,00	118	29.50
28½	7.12	58½	14.62	88½	22.12	118½	29.62
29	7.25	59	14.75	89	22.25	119	29.75
29½	7.37	59½	14.87	89½	22.37	119½	29.87
30	7.50	60	15.00	90	22.50	120	30.00

AT 25½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	7.78	60½	15.43	90½	23.08
		31	7.90	61	15.55	91	23.20
		31½	8.03	61½	15.68	91½	23.33
2	0.51	32	8.16	62	15.81	92	23.46
2½	0.64	32½	8.29	62½	15.94	92½	23.59
3	0.76	33	8.41	63	16.c	93	23.71
3½	0.89	33½	8 54	63½	16.19	93½	23.84
4	1.02	34	8.67	64	16.32	94	23.97
4½	1.15	34½	8.80	64½	16.45	94½	24.10
5	1.27	35	8.92	65	16.57	95	24.22
5½	1.40	35½	9.05	65½	16.70	95½	24.35
6	1.53	36	9.18	66	16.83	96	24.48
6½	1.66	36½	9.31	66½	16.96	96½	24.61
7	1.78	37	9.43	67	17.08	97	2:.73
7½	1.91	37½	9.56	67½	17.21	97½	24.86
8	2.04	38	9.69	68	17.34	98	24.99
8½	2.17	38½	9.82	68½	17.47	98½	25.12
9	2.29	39	9.94	69	17.59	99	25 24
9½	2.42	39½	10.07	69½	17.72	99½	25.37
10	2.55	40	10.20	70	17.85	100	25.50
10½	2.68	40½	10.33	70½	17.98	100½	25.63
11	2.80	41	10.45	71	18.10	101	25.75
11½	2.93	41½	10.58	71½	18.23	101½	25.88
12	3.06	42	10.71	72	18.36	102	26.01
12½	3.19	42½	10.84	72½	18.49	102½	26.14
13	3.31	43	10.96	73	18.61	103	26.26
13½	3.44	43½	11.09	73½	18.74	103½	26.39
14	3.57	44	11.22	74	18.87	104	26.52
14½	3.70	44½	11.35	74½	19.00	104½	26.65
15	3.82	45	11.47	75	19.12	105	26.77
15½	3.95	45½	11.60	75½	19.25	105½	26.90
16	4.08	46	11.73	76	19.38	106	27.03
16½	4.21	46½	11.86	76½	19.51	106½	27.16
17	4.33	47	11.98	77	19.63	107	27.28
17½	4.46	47½	12.11	77½	19.76	107½	27.41
18	4.59	48	12.24	78	19.89	108	27.54
18½	4.72	48½	12.37	78½	20.02	108½	27.67
19	4.84	49	12.49	79	20.15	109	27.79
19½	4.97	49½	12.62	79½	20.27	109½	27.92
20	5.10	50	12.75	80	20.40	110	28.05
20½	5.23	50½	12.88	80½	20.53	110½	28.18
21	5.35	51	13.00	81	20.65	111	28.30
21½	5.48	51½	13.13	81½	20.78	111½	28.43
22	5.61	52	13.26	82	20.91	112	28.56
22½	5.74	52½	13.39	82½	21.04	112½	28.69
23	5.86	53	13.51	83	21.16	113	28.81
23½	5.99	53½	13.64	83½	21.29	113½	28.94
24	6.12	54	13.77	84	21.42	114	29.07
24½	6.25	54½	13.90	84½	21.55	114½	29.20
25	6.37	55	14.02	85	21.67	115	29.32
25½	6.50	55½	14.15	85½	21.80	115½	29.45
26	6.63	56	14.28	86	21.03	116	29.58
26½	6.76	56½	14.41	86½	22.06	116½	29.71
27	6.88	57	14.53	87	22.18	117	29.83
27½	7.01	57½	14.66	87½	22.31	117½	29.96
28	7.14	58	14.79	88	22.44	118	30.09
28½	7.27	58½	14.02	88½	22.57	118½	30.22
29	7.39	59	15.04	89	22.69	119	30'34
29½	7.52	59½	15.17	89½	22.82	119½	30.47
30	7.65	60	15.30	90	22.95	120	30.60

AT 26 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	7.93	60½	15.73	90½	23.53
		31	8.06	61	15.86	91	23.66
		31½	8.19	61½	15.99	91½	23.79
2	0.52	32	8.32	62	16.12	92	23.92
2½	0.65	32½	8.45	62½	16.25	92½	24.05
3	0.78	33	8.58	63	16.38	93	24.18
3½	0.91	33½	8.71	63½	16.51	93½	24.31
4	1.04	34	8.84	64	16.64	94	24.44
4½	1.17	34½	8.97	64½	16.77	94½	24.57
5	1.30	35	9.10	65	16.90	95	24.70
5½	1.43	35½	9.23	65½	17.03	95½	24.83
6	1.56	36	9.36	66	17.16	96	24.96
6½	1.69	36½	9.49	66½	17.29	96½	25.09
7	1.82	37	9.62	67	17.32	97	25.22
7½	1.95	37½	9.75	67½	17.45	97½	25.35
8	2.08	38	9.88	68	17.58	98	25.48
8½	2.21	38½	10 01	68½	17.71	98½	25.61
9	2.34	39	10.14	69	17.84	99	25.74
9½	2.47	39½	10.27	69½	17.97	99½	25.87
10	2.60	40	10.40	70	18.10	100	26.00
10½	2.73	40½	10.53	70½	18.23	100½	26.13
11	2.86	41	10.66	71	18.36	101	26.26
11½	2.99	41½	10.79	71½	18.49	101½	26.39
12	3.12	42	10.92	72	18.62	102	26.52
12½	3.25	42½	11.05	72½	18.75	102½	26.65
13	3.38	43	11.18	73	18.88	103	26.78
13½	3.51	43½	11.31	73½	19.01	103½	26.91
14	3.64	44	11.44	74	19.24	104	27.04
14½	3.77	44½	11.57	74½	19.37	104½	27.17
15	3.90	45	11.70	75	19.50	105	27.30
15½	4.03	45½	11.83	75½	19.63	105½	27.43
16	4.16	46	11.96	76	19.76	106	27.56
16½	4.29	46½	12.09	76½	19.89	106½	27.69
17	4.42	47	12.22	77	20.02	107	27.82
17½	4.55	47½	12.35	77½	20.15	107½	27.95
18	4.68	48	12.48	78	20.28	108	28.08
18½	4.81	48½	12.61	78½	20.41	108½	28.21
19	4.94	49	12.74	79	20.54	109	28.34
19½	5.07	49½	12.87	79½	20.67	109½	28.47
20	5.20	50	13.00	80	20.80	110	28.60
20½	5.33	50½	13.13	80½	20.93	110½	28.73
21	5.46	51	13.26	81	21.06	111	28.86
21½	5.59	51½	13.39	81½	21.19	111½	28.99
22	5.72	52	13.52	82	21.32	112	29.12
22½	5.85	52½	13.65	82½	21.45	112½	29.25
23	5.98	53	13.78	83	21.58	113	29.38
23½	6.11	53½	13.91	83½	21.71	113½	29.51
24	6.24	54	14.04	84	21.84	114	29.64
24½	6.37	54½	14.17	84½	21.97	114½	29.77
25	6.50	55	14.30	85	22.10	115	29.90
25½	6.63	55½	14.43	85½	22.23	115½	30.03
26	6.76	56	14.56	86	22.36	116	30.16
26½	6.89	56½	14.69	86½	22.49	116½	30.29
27	7.02	57	14.82	87	22.62	117	30.42
27½	7.15	57½	14.95	87½	22.75	117½	30.55
28	7.28	58	15.08	88	22.88	118	30.68
28½	7.41	58½	15.21	88½	23.01	118½	30 81
29	7.54	59	15.34	89	23.14	119	30.94
29½	7.67	59½	15.47	89½	23.27	119½	31 07
30	7.80	60	15.60	90	23.40	120	31.20

AT 26½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	8.08	60½	16.03	90½	23.98
		31	8.21	61	16.16	91	24.11
		31½	8.35	61½	16.30	91½	24.25
2	0.53	32	8.48	62	16.43	92	24.38
2½	0.66	32½	8.61	62½	16.56	92½	24.51
3	0.79	33	8.74	63	16.69	93	24 64
3½	0.93	33½	8.88	63½	16.83	93½	24.78
4	1.06	34	9.01	64	16.96	94	24.91
4½	1.19	34½	9.14	64½	17.09	94½	25.04
5	1.32	35	9.27	65	17.22	95	25.17
5½	1.46	35½	9.41	65½	17.36	95½	25 31
6	1.59	36	9.54	66	17.49	96	25.44
6½	1.72	36½	9.67	66½	17.62	96½	25.57
7	1.85	37	9.80	67	17.75	97	25.70
7½	1.99	37½	9.94	67½	17.89	97½	25.84
8	2.12	38	10.07	68	18.02	98	25.97
8½	2.25	38½	10.20	68½	18.15	98½	26.10
9	2.38	39	10.33	69	18.28	99	26.23
9½	2.52	39½	10.47	69½	18.42	99½	26.37
10	2.65	40	10.60	70	18.55	100	26.50
10½	2.78	40½	10.73	70½	18.68	100½	26.63
11	2.91	41	10.86	71	18.81	101	26.76
11½	3.05	41½	11.00	71½	18.95	101½	26.90
12	3.18	42	11.13	72	19.08	102	27.03
12½	3.31	42½	11.26	72½	19.21	102½	27.16
13	3.44	43	11.39	73	19.34	103	27.29
13½	3.58	43½	11.53	73½	19.48	103½	27.33
14	3.71	44	11.66	74	19.61	104	27.46
14½	3.84	44½	11.79	74½	19.74	104½	27.59
15	3.97	45	11.92	75	19.87	105	27.72
15½	4.11	45½	12.06	75½	20.01	105½	27.86
16	4.24	46	12.19	76	20.14	106	27.99
16½	4.37	46½	12.32	76½	20.27	106½	28.12
17	4.50	47	12.45	77	20.40	107	28.25
17½	4.64	47½	12.59	77½	20.54	107½	28.39
18	4.77	48	12.72	78	20.67	108	28.52
18½	4.90	48½	12.85	78½	20.80	108½	28.75
19	5.03	49	12.98	79	20.93	109	28.88
19½	5.17	49½	13.12	79½	21.07	109½	29.02
20	5.30	50	13.25	80	21.20	110	29.15
20½	5.43	50½	13.38	80½	21.33	110½	29.28
21	5.56	51	13.51	81	21.46	111	29.41
21½	5.70	51½	13.65	81½	21.60	111½	29.55
22	5.83	52	13.78	82	21.73	112	29.68
22½	5.96	52½	13.91	82½	21.86	112½	29.81
23	6.09	53	14.04	83	21.99	113	29.94
23½	6.23	53½	14.18	83½	22.13	113½	30.08
24	6.36	54	14.31	84	22.26	114	30.21
24½	6.49	54½	14.44	84½	22.39	114½	30 34
25	6.61	55	14.57	85	22.52	115	30.47
25½	6.75	55½	14.71	85½	22.66	115½	30.61
26	6.89	56	14.84	86	22.79	116	30.74
26½	7.02	56½	14.97	86½	22.92	116½	30.87
27	7.15	57	15.10	87	23.05	117	31.00
27½	7.29	57½	15.24	87½	23.19	117½	31.14
28	7.42	58	15.37	88	23 32	118	31.27
28½	7.55	58½	15.50	88½	23.45	118½	31.40
29	7.68	59	15.63	89	23.58	119	31.53
29½	7.82	59½	15.77	89½	23.72	119½	31.67
30	7.95	60	15.90	90	23.85	120	31.80

AT 27 CENTS PER HOUR.

Hrs.	Am't	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	8.23	60½	16.33	90½	24.43
		31	8.37	61	16.47	91	24.57
		31½	8.50	61½	16.60	91½	24.70
2	0.54	32	8.64	62	16.74	92	24.84
2½	0.67	32½	8.77	62½	16.87	92½	24.97
3	0.81	33	8.91	63	17.01	93	25.11
3½	0.94	33½	9.04	63½	17.14	93½	25.24
4	1.08	34	9.18	64	17.28	94	25.38
4½	1.21	34½	9.31	64½	17.41	94½	25.51
5	1.35	35	9.45	65	17.55	95	25.65
5½	1.48	35½	9.58	65½	17.68	95½	25.78
6	1.62	36	9.72	66	17.82	96	25.92
6½	1.75	36½	9.85	66½	17.95	96½	26.05
7	1.89	37	9.99	67	18.09	97	26.19
7½	2.02	37½	10.12	67½	18.22	97½	26.32
8	2.16	38	10.26	68	18.36	98	26.46
8½	2.29	38½	10.39	68½	18.49	98½	26.59
9	2.43	39	10.53	69	18.63	99	26.73
9½	2.56	39½	10.66	69½	18.76	99½	26.86
10	2.70	40	10.80	70	18.90	100	27.00
10½	2.83	40½	10.93	70½	19.03	100½	27.13
11	2.97	41	11.07	71	19.17	101	27.27
11½	3.10	41½	11.20	71½	19.30	101½	27.40
12	3.24	42	11.34	72	19.44	102	27.54
12½	3.37	42½	11.47	72½	19.57	102½	27.67
13	3.51	43	11.61	73	19.71	103	27.81
13½	3.64	43½	11.74	73½	19.84	103½	27.94
14	3.78	44	11.88	74	19.98	104	28.08
14½	3.91	44½	12.01	74½	20.11	104½	28.21
15	4.05	45	12.15	75	20.25	105	28.35
15½	4.18	45½	12.28	75½	20.38	105½	28.48
16	4.32	46	12.42	76	20.52	106	28.62
16½	4.45	46½	12.55	76½	20.65	106½	28.75
17	4.59	47	12.69	77	20.79	107	28.89
17½	4.72	47½	12.82	77½	20.92	107½	29.02
18	4.86	48	12.96	78	21.06	108	29.16
18½	4.99	48½	13.09	78½	21.19	108½	29.29
19	5.13	49	13.23	79	21.33	109	29.43
19½	5.26	49½	13.36	79½	21.46	109½	29.56
20	5.40	50	13.50	80	21.60	110	29.70
20½	5.53	50½	13.63	80½	21.73	110½	29.83
21	5.67	51	13.77	81	21.87	111	29.97
21½	5.80	51½	13.90	81½	22.00	111½	30.10
22	5.94	52	14.04	82	22.14	112	30.24
22½	6.07	52½	14.17	82½	22.27	112½	30.37
23	6.21	53	14.31	83	22.41	113	30.51
23½	6.34	53½	14.44	83½	22.54	113½	30.64
24	6.48	54	14.58	84	22.68	114	30.78
24½	6.61	54½	14.71	84½	22.81	114½	30.91
25	6.75	55	14.85	85	22.95	115	31.05
25½	6.88	55½	14.98	85½	23.08	115½	31.18
26	7.02	56	15.12	86	23.22	116	31.32
26½	7.15	56½	15.25	86½	23.35	116½	31.45
27	7.29	57	15.39	87	23.49	117	31.59
27½	7.42	57½	15.52	87½	23.62	117½	31.72
28	7.56	58	15.66	88	23.76	118	31.86
28½	7.69	58½	15.79	88½	23.89	118½	31.99
29	7.83	59	15.93	89	24.03	119	32.13
29½	7.96	59½	16.06	89½	24.16	119½	32.26
30	8.10	60	16.20	90	24.30	120	32.40

AT 27½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't
		30½	8.39	60½	16.64	90½	24.89
		31	8.52	61	16.77	91	25.02
		31½	8.66	61½	16.91	91½	25.16
2	0.55	32	8.80	62	17.05	92	25.30
2½	0.69	32½	8.94	62½	17.19	92½	25.44
3	0.82	33	9.07	63	17.32	93	25.57
3½	0.96	33½	9.21	63½	17.46	93	25.71
4	1.10	34	9.35	64	17.60	94	25.85
4½	1.24	34½	9.49	64½	17.74	94½	25.99
5	1.37	35	9.62	65	17.87	95	26.12
5½	1.51	35½	9.76	65½	18.01	95½	26.26
6	1.65	36	9.90	66	18.15	96	26.40
6½	1.79	36½	10.04	66½	18.29	96½	26.54
7	1.92	37	10.17	67	18.42	97	26.67
7½	2.06	37½	10.31	67½	18.56	97½	26.81
8	2.20	38	10.45	68	18.70	98	26.95
8½	2.34	38½	10.59	68½	18.84	98½	27.09
9	2.47	39	10.72	69	18.97	99	27.22
9½	2.61	39½	10.86	69½	19.11	99½	27.36
10	2.75	40	11.00	70	19.25	100	27.50
10½	2.89	40½	11.14	70½	19.39	100½	27.64
11	3.02	41	11.27	71	19.52	101	27.77
11½	3.16	41½	11.41	71½	19.66	101½	27.91
12	3.30	42	11.55	72	19.80	102	28.05
12½	3.44	42½	11.69	72½	19.94	102½	28.19
13	3.57	43	11.82	73	20.07	103	28.32
13½	3.71	43½	11.96	73½	20.21	103½	28.46
14	3.85	44	12.10	74	20.35	104	28.60
14½	3.99	44½	12.24	74½	20.49	104½	28.74
15	4.12	45	12.37	75	20.62	105	28.87
15½	4.26	45½	12.51	75½	20.76	105½	29.01
16	4.40	46	12.65	76	20.90	106	29.15
16½	4.54	46½	12.79	76½	21.04	106½	29.29
17	4.67	47	12.92	77	21.17	107	29.42
17½	4.81	47½	13.06	77½	21.31	107½	29.56
18	4.95	48	13.20	78	21.45	108	29.70
18½	5.09	48½	13.34	78½	21.59	108½	29.84
19	5.22	49	13.47	79	21.72	109	29.97
19½	5.36	49½	13.61	79½	21.86	109½	30.11
20	5.50	50	13.75	80	22.00	110	30.25
20½	5.64	50½	13.89	80½	22.14	110½	30.39
21	5.77	51	14.02	81	22.27	111	30.52
21½	5.91	51½	14.16	81½	22.41	111½	30.66
22	6.05	52	14.30	82	22.55	112	30.80
22½	6.19	52½	14.44	82½	22.69	112½	30.94
23	6.32	53	14.57	83	22.82	113	31.07
23½	6.46	53½	14.71	83½	22.96	113½	31.21
24	6.60	54	14.85	84	23.10	114	31.35
24½	6.74	54½	14.99	84½	23.24	114½	31.49
25	6.87	55	15.12	85	23.37	115	31.62
25½	7.01	55½	15.26	85½	23.51	115½	31.76
26	7.15	56	15.40	86	23.65	116	31.90
26½	7 29	56½	15.54	86½	23.79	116½	32.04
27	7.42	57	15.67	87	23.92	117	32.17
27½	7.56	57½	15.81	87½	24.06	117½	32.31
28	7.70	58	15.95	88	24.20	118	32.45
28½	7.84	58½	16.09	88½	24.34	118½	32.59
29	7.97	59	16.22	89	24.47	119	32.72
29½	8.11	59½	16.36	89½	24.61	119½	32.86
30	8.25	60	16.50	90	24.75	120	33.00

AT 28 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	8.54	60½	16.94	90½	25.34
		31	8.68	61	17.08	91	25.48
		31½	8.82	61½	17.22	91½	25.62
2	0.56	32	8.96	62	17.36	92	25.76
2½	0.70	32½	9.10	62½	17.50	92½	25.90
3	0.84	33	9.24	63	17.64	93	26.04
3½	0.98	33½	9.38	63½	17.78	93½	26.18
4	1.12	34	9.52	64	17.92	94	26.32
4½	1.26	34½	9.66	64½	18.06	94½	26.46
5	1.40	35	9.80	65	18.20	95	26.60
5½	1.54	35½	9.94	65½	18.34	95½	26.74
6	1.68	36	10 08	66	18.48	96	26.88
6½	1.82	36½	10.22	66½	18.62	96½	27.02
7	1.96	37	10.36	67	18.76	97	27.16
7½	2.10	37½	10.50	67½	18.90	97½	27.30
8	2.24	38	10.64	68	19.04	98	27.44
8½	2.38	38½	10.78	68½	19.18	98½	27.58
9	2.52	39	10.92	69	19.32	99	27.72
9½	2.66	39½	11.06	69½	19.46	99½	27.86
10	2.80	40	11.20	70	19.60	100	28.00
10½	2.94	40½	11.34	70½	19.74	100½	28.14
11	3.08	41	11.48	71	19.88	101	28.28
11½	3.22	41½	11.62	71½	20.02	101½	28.42
12	3.36	42	11.76	72	20.16	102	28.56
12½	3.50	42½	11.90	72½	20.30	102½	28.70
13	3.64	43	12.04	73	20.44	103	28.84
13½	3.78	43½	12.18	73½	20.58	103½	28.98
14	3.92	44	12.32	74	20.72	104	29.12
14½	4.06	44½	12.46	74½	20.86	104½	29.26
15	4.20	45	12.60	75	21.00	105	29.40
15½	4.34	45½	12.74	75½	21.14	105½	29.54
16	4.48	46	12.88	76	21.28	106	29.68
16½	4.62	46½	13.02	76½	21.42	106½	29.82
17	4.76	47	13.16	77	21.56	107	29.96
17½	4.90	47½	13.30	77½	21.70	107½	30.10
18	5.04	48	13.44	78	21.84	108	30.24
18½	5.18	48½	13.58	78½	21.98	108½	30.38
19	5.32	49	13.72	79	22.12	109	30.52
19½	5.46	49½	13.86	79½	22.26	109½	30.66
20	5.60	50	14.00	80	22.40	110	30.80
20½	5.74	50½	14.14	80½	22.54	110½	30.94
21	5.88	51	14.28	81	22.68	111	31.08
21½	6.02	51½	14.42	81½	22.82	111½	31.22
22	6.16	52	14.56	82	22.96	112	31.36
22½	6.30	52½	14.70	82½	23.10	112½	31.50
23	6.44	53	14.84	83	23.24	113	31.64
23½	6.58	53½	14.98	83½	23.38	113½	31.78
24	6.72	54	15.12	84	23.52	114	31.92
24½	6.86	54½	15.26	84½	23.66	114½	32.06
25	7.00	55	15.40	85	23.80	115	32.20
25½	7.14	55½	15.54	85½	23.94	115½	32.34
26	7.28	56	15.68	86	24.08	116	32.48
26½	7.42	56½	15.82	86½	24.22	116½	32.62
27	7.56	57	15.96	87	24.36	117	32.76
27½	7.70	57½	16.10	87½	24.50	117½	32.90
28	7.84	58	16.24	88	24.64	118	33.04
28½	7.98	58½	16.38	88½	24.78	118½	33.18
29	8.12	59	16.52	89	24.92	119	33.32
29½	8.26	59½	16.66	89½	25.06	119½	33.46
30	8.40	60	16.80	90	25.20	120	33.60

AT 28½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	8.69	60½	17.24	90½	25.79
		31	8.83	61	17.38	91	25.93
		31½	8.98	61½	17.53	91½	26.08
2	0.57	32	9.12	62	17.67	92	26.22
2½	0.71	32½	9.26	62½	17.81	92½	26.36
3	0.85	33	9.40	63	17.95	93	26.50
3½	1.00	33½	9.55	63½	18.10	93½	26.65
4	1.14	34	9.69	64	18.24	94	26.79
4½	1.28	34½	9.83	64½	18.38	94½	26.93
5	1.42	35	9.97	65	18.52	95	27.07
5½	1.57	35½	10.12	65½	18.67	95½	27.22
6	1.71	36	10.26	66	18.81	96	27.36
6½	1.85	36½	10.40	66½	18.95	96½	27.50
7	1.99	37	10.54	67	19.09	97	27.64
7½	2.14	37½	10.69	67½	19.24	97½	27.79
8	2.28	38	10.83	68	19.38	98	27.93
8½	2.42	38½	10.97	68½	19.52	98½	28.07
9	2.56	39	11.11	69	19.66	99	28.21
9½	2.71	39½	11.26	69½	19.81	99½	28.36
10	2 85	40	11.40	70	19.95	100	28.50
10½	2.99	40½	11.54	70½	20.09	100½	28.64
11	3.13	41	68	71	20.23	101	28.78
11½	3.28	41½	11.83	71½	20.38	101½	28.63
12	3.42	42	11.97	72	20.52	102	29.07
12½	3.56	42½	12.11	72½	20.66	102½	29.21
13	3.70	43	12.25	73	20.80	103	29.35
13½	3.85	43½	12.40	73½	20.95	103½	29.50
14	3.99	44	12.54	74	21.09	104	29.64
14½	4.13	44½	12.68	74½	21.23	104½	29.78
15	4.27	45	12.82	75	21.37	105	29.92
15½	4.42	45½	12.97	75½	21.52	105½	30.07
16	4.56	46	13.11	76	21.66	106	30.21
16½	4.70	46½	13.25	76½	21.80	106½	30.35
17	4.84	47	13.39	77	21.94	107	30.49
17½	4.99	47½	13.54	77½	22.09	107½	30.64
18	5.13	48	13.68	78	22.23	108	30.78
18½	5.27	48½	13.82	78½	22.37	108½	30.92
19	5.41	49	13.96	79	22.51	109	31.06
19½	5.56	49½	14.11	79½	22.66	109½	31.21
20	5.70	50	14.25	80	22.80	110	31.35
20½	5.84	50½	14.39	80½	22.94	110½	31.49
21	5.98	51	14.53	81	23.08	111	31.63
21½	6.13	51½	14.68	81½	23.23	111½	31.78
22	6.27	52	14.82	82	23 37	112	31.92
22½	6.41	52½	14.96	32½	23.51	112½	32.06
23	6.55	53	15.10	83	23.65	113	32.20
23½	6.70	53½	15.25	83½	23.80	113½	32.35
24	6.84	54	15.39	84	23.94	114	[illegible]
24½	6.98	54½	15.53	84½	24.08	114½	32.63
25	7.12	55	15.67	85	24.22	115	32.77
25½	7.27	55½	15.82	85½	24.37	115½	32.92
26	7.41	56	15.96	86	24.51	116	33.06
26½	7.55	56½	16.10	86½	24.65	116½	33.20
27	7.69	57	16.24	87	24.79	117	33.34
27½	7.84	57½	16.39	87½	24.94	117½	33.49
28	7.98	58	16.53	88	25.08	118	33.63
28½	8.12	58½	16.67	88½	25.22	118½	33.77
29	8.26	59	16.81	89	25.36	119	33.91
29½	8.41	59½	16.96	89½	25.51	119½	34.06
30	8.55	60	17.10	90	25.65	120	34.20

AT 29 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	8.84	60½	17.54	90½	26.24
		31	8.99	61	17.69	91	26.39
		31½	9.13	61½	17.83	91½	26.53
2	0.58	32	9.28	62	17.98	92	26.68
2½	0.72	32½	9.42	62½	18.12	92½	26.82
3	0.87	33	9.57	63	18.27	93	26.97
3½	1.01	33½	9.71	63½	18.41	93½	27.11
4	1.16	34	9.86	64	18.56	94	27.26
4½	1.30	34½	10 00	64½	18.70	94½	27.40
5	1.45	35	10.15	65	18.85	95	27.55
5½	1.59	35½	10.29	65½	18.99	95½	27.69
6	1.74	36	10.44	66	19.14	96	27.84
6½	1.88	36½	10.58	66½	19.28	96½	27.98
7	2.03	37	10.73	67	19.43	97	28.13
7½	2.17	37½	10.87	67½	19.57	97½	28.27
8	2.32	38	11.02	68	19.72	98	28.42
8½	2.46	38½	11.16	68½	19.86	98½	28.56
9	2.61	39	11.31	69	20.01	99	28.71
9½	2.75	39½	11.45	69½	20.15	99½	28.85
10	2.90	40	11.60	70	20.30	100	29.00
10½	3.04	40½	11.74	70½	20.44	100½	29.14
11	3.19	41	11.89	71	20.59	101	29.29
11½	3.33	41½	12.03	71½	20.73	101½	29.43
12	3.48	42	12.18	72	20.88	102	29.58
12½	3.62	42½	12.32	72½	21.02	102½	29.72
13	3.77	43	12.47	73	21.17	103	29.87
13½	3.91	43½	12.61	73½	21.31	103½	30.01
14	4.06	44	12.76	74	21.46	104	30.16
14½	4.20	44½	12.90	74½	21.60	104½	30.30
15	4.35	45	13.05	75	21.75	105	30.45
15½	4.49	45½	13.19	75½	21.89	105½	30.59
16	4.64	46	13.34	76	22.04	106	30.74
16½	4.78	46½	13.48	76½	22.18	106½	30.88
17	4.93	47	13.63	77	22.33	107	31.03
17½	5.07	47½	13.77	77½	22.47	107½	31.17
18	5.22	48	13.92	78	22.62	108	31.32
18½	5.36	48½	14.06	78½	22.76	108½	31.46
19	5.51	49	14.21	79	22.91	109	31.61
19½	5.65	49½	14.35	79½	23.05	109½	31.75
20	5.80	50	14.50	80	23.20	110	31.90
20½	5.94	50½	14.64	80½	23.34	110½	32.04
21	6.09	51	14.79	81	23.49	111	32.19
21½	6.23	51½	14.93	81½	23.63	111½	32.33
22	6.38	52	15.08	82	23.78	112	32.48
22½	6.52	52½	15.22	82½	23.92	112½	32.62
23	6.67	53	15.37	83	24.07	113	32.77
23½	6.81	53½	15.51	83½	24.21	113½	32.91
24	6.96	54	15.66	84	24.36	114	33.06
24½	7.10	54½	15.80	84½	24.50	114½	33.20
25	7.25	55	15.95	85	24.65	115	33.35
25½	7.39	55½	16.09	85½	24.79	115½	33.49
26	7.54	56	16.24	86	24.94	116	33.64
26½	7.68	56½	16.38	86½	25.08	116½	33.78
27	7.83	57	16.53	87	25.23	117	33.93
27½	7.97	57½	16.67	87½	25.37	117½	34.07
28	8.12	58	16.82	88	25.52	118	34.22
28½	8.26	58½	16.96	88½	25.66	118½	34.36
29	8.41	59	17.11	89	25.81	119	34.51
29½	8.55	59½	17.25	89½	25.95	119½	34.65
30	8.70	60	17.40	90	26.10	120	34.80

AT 29½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	9.00	60½	17.85	90½	26.70
		31	9.14	61	17.99	91	26.84
		31½	9.29	61½	18.14	91½	26.99
2	0.59	32	9.44	62	18.29	92	27.14
2½	0.74	32½	9.59	62½	18.44	92½	27.29
3	0.88	33	9.73	63	18.58	93	27.43
3½	1.03	33½	9.88	63½	18.73	93½	27.58
4	1.18	34	10.03	64	18.88	94	27.73
4½	1.33	34½	10.18	64½	19.03	94½	27.88
5	1.47	35	10.32	65	19.17	95	28.02
5½	1.62	35½	10.47	65½	19.32	95½	28.17
6	1.77	36	10.62	66	19.47	96	28.32
6½	1.92	36½	10.77	66½	19.62	96½	28.47
7	2.06	37	10.91	67	19.76	97	28.61
7½	2.21	37½	11.06	67½	19.91	97½	28.76
8	2.36	38	11.21	68	20.06	98	28.91
8½	2.51	38½	11.36	68½	20.21	98½	29.05
9	2.65	39	11.50	69	20.35	99	29.20
9½	2.80	39½	11.65	69½	20.50	99½	29.35
10	2.95	40	11.80	70	20.65	100	29.50
10½	3.10	40½	11.95	70½	20.80	100½	29.65
11	3.24	41	12.09	71	20.94	101	29.79
11½	3.39	41½	12.24	71½	21.09	101½	29.94
12	3.54	42	12.39	72	21.24	102	30.09
12½	3.69	42½	12.54	72½	21.39	102½	30.24
13	3.83	43	12.68	73	21.53	103	30.38
13½	3.98	43½	12.83	73½	21.68	103½	30.53
14	4.13	44	12.98	74	21.83	104	30.68
14½	4.28	44½	13.13	74½	21.98	104½	30.83
15	4.42	45	13.27	75	22.12	105	30.97
15½	4.57	45½	13.42	75½	22.27	105½	31.12
16	4.72	46	13.57	76	22.42	106	31.27
16½	4.87	46½	13.72	76½	22.57	106½	31.42
17	5.01	47	13.86	77	22.71	107	31.56
17½	5.16	47½	14.01	77½	22.86	107½	31.71
18	5.31	48	14.16	78	23.01	108	31.86
18½	5.46	48½	14.31	78½	23.16	108½	32.01
19	5.60	49	14.45	79	23.30	109	32.15
19½	5.75	49½	14.60	79½	23.45	109½	32.30
20	5.90	50	14.75	80	23.60	110	32.45
20½	6.05	50½	14.90	80½	23.75	110½	32.60
21	6.19	51	15.04	81	23.89	111	32.74
21½	6.34	51½	15.19	81½	24.04	111½	32.89
22	6.49	52	15.34	82	24.19	112	33.04
22½	6.64	52½	15.49	82½	24.34	112½	33.19
23	6.78	53	15.63	83	24.48	113	33.33
23½	6.93	53½	15.78	83½	24.63	113½	33.48
24	7.08	54	15.92	84	24.78	114	33.63
24½	7.23	54½	16.07	84½	24.93	114½	33.78
25	7.37	55	16.22	85	25.07	115	33 92
25½	7.52	55½	16.37	85½	25.22	115½	34.07
26	7.67	56	16.52	86	25.37	116	34.22
26½	7.82	56½	16.67	86½	25.52	116½	34.37
27	7.96	57	16.81	87	25.66	117	34.51
27½	8.11	57½	16.96	87½	25.81	117½	34.66
28	8.26	58	17.11	88	25.96	118	34.81
28½	8.41	58½	17.26	88½	26.11	118½	34.96
29	8.55	59	17.40	89	26.25	119	35.10
29½	8.70	59½	17.55	89½	26.40	119½	35.25
30	8.85	60	17.70	90	26.55	120	35.40

AT 30 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	9.15	60½	18.15	90½	27.15
		31	9.30	61	18.30	91	27.30
		31½	9.45	61½	18.45	91½	27.45
2	0.60	32	9.60	62	18.60	92	27.60
2½	0.75	32½	9.75	62½	18.75	92½	27.75
3	0.90	33	9.90	63	18.90	93	27.90
3½	1.05	33½	10.05	63½	19.05	93½	28.05
4	1.20	34	10.20	64	19.20	94	28.20
4½	1.35	34½	10.35	64½	19.35	94½	28.35
5	1.50	35	10.50	65	19.50	95	28.50
5½	1.65	35½	10.65	65½	19.65	95½	28.65
6	1.80	36	10.80	66	19.80	96	28.80
6½	1.95	36½	10.95	66½	19.95	96½	28.95
7	2.10	37	11.10	67	20.10	97	29.10
7½	2.25	37½	11.25	67½	20.25	97½	29.25
8	2.40	38	11.40	68	20.40	98	29.40
8½	2.55	38½	11.55	68½	20.55	98½	29.55
9	2.70	39	11.70	69	20.70	99	29.70
9½	2.85	39½	11.85	69½	20.85	99½	29.85
10	3.00	40	12.00	70	21.00	100	30.00
10½	3.15	40½	12.15	70½	21.15	100½	30.15
11	3.30	41	12.30	71	21.30	101	30.30
11½	3.45	41½	12.45	71½	21.45	101½	30.45
12	3.60	42	12.60	72	21.60	102	30.60
12½	3.75	42½	12.75	72½	21.75	102½	30.75
13	3.90	43	12.90	73	21.90	103	30.90
13½	4.05	43½	13.05	73½	22.05	103½	31.05
14	4.20	44	13.20	74	22.20	104	31.20
14½	4.35	44½	13.35	74½	22.35	104½	31.35
15	4.50	45	13.50	75	22.50	105	31.50
15½	4.65	45½	13.65	75½	22.65	105½	31.65
16	4.80	46	13.80	76	22.80	106	31.80
16½	4.95	46½	13.95	76½	22.95	106½	31.95
17	5.10	47	14.10	77	23.10	107	32.10
17½	5.25	47½	14.25	77½	23.25	107½	32.25
18	5.40	48	14.40	78	23.40	108	32.40
18½	5.55	48½	14.55	78½	23.55	108½	32.55
19	5.70	49	14.70	79	23.70	109	32.70
19½	5.85	49½	14.85	79½	23.85	109½	32.85
20	6.00	50	15.00	80	24.00	110	33.00
20½	6.15	50½	15.15	80½	24.15	110½	33.15
21	6.30	51	15.30	81	24.30	111	33.30
21½	6.45	51½	15.45	81½	24.45	111½	33.45
22	6.60	52	15.60	82	24.60	112	33.60
22½	6.75	52½	15.75	82½	24.75	112½	33.75
23	6.90	53	15.90	83	24.90	113	33.90
23½	7.05	53½	16.05	83½	25.05	113½	34.05
24	7.20	54	16.20	84	25.20	114	34.20
24½	7.35	54½	16.35	84½	25.35	114½	34.35
25	7.50	55	16.50	85	25.50	115	34.50
25½	7.65	55½	16.65	85½	25.65	115½	34.65
26	7.80	56	16.80	86	25.80	116	34.80
26½	7.95	56½	16.95	86½	25.95	116½	34.95
27	8.10	57	17.10	87	26.10	117	35.10
27½	8.25	57½	17.25	87½	26.25	117½	35.25
28	8.40	58	17.40	88	26.40	118	35.40
28½	8.55	58½	17.55	88½	26.55	118½	35.55
29	8.70	59	17.70	89	26.70	119	35.70
29½	8.85	59½	17.85	89½	26.85	119½	35.85
30	9.00	60	18.00	90	27.00	120	36.00

AT 30½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	9.30	60½	18.45	90½	27.60
		31	9.45	61	18.60	91	27.75
		31½	9.61	61½	18.76	91½	27.91
2	0.61	32	9.76	62	18.91	92	28.06
2½	0.76	32½	9.91	62½	19.06	92½	28.21
3	0.91	33	10.06	63	19.21	93	28.36
3½	1.07	33½	10.22	63½	19.37	93½	28.52
4	1.22	34	10.37	64	19.52	94	28.67
4½	1.37	34½	10.52	64½	19.67	94½	28.82
5	1.52	35	10.67	65	19.82	95	28.97
5½	1.68	35½	10.83	65½	19.98	95½	29.13
6	1.83	36	10.98	66	20.13	96	29.28
6½	1.98	36½	11.13	66½	20.28	96½	29.43
7	2.13	37	11.28	67	20.43	97	29.58
7½	2.29	37½	11.44	67½	20.59	97½	29.74
8	2.44	38	11.59	68	20.74	98	29.89
8½	2.59	38½	11.74	68½	20.89	98½	30.04
9	2.74	39	11.89	69	21.04	99	30.19
9½	2.90	39½	12.05	69½	21.20	99½	30.35
10	3.05	40	12.20	70	21.35	100	30.50
10½	3.20	40½	12.35	70½	21.50	100½	30.65
11	3.35	41	12.50	71	21.65	101	30.80
11½	3.51	41½	12.66	71½	21.81	101½	30.96
12	3.66	42	12.81	72	21.96	102	31.11
12½	3.81	42½	12.96	72½	22.11	102½	31.26
13	3.96	43	13.11	73	22.26	103	31.41
13½	4.12	43½	13.27	73½	22.42	103½	31.57
14	4.27	44	13.42	74	22.57	104	31.72
14½	4.42	44½	13.57	74½	22.72	104½	31.87
15	4.57	45	13.72	75	22.87	105	32.02
15½	4.73	45½	13.88	75½	23.03	105½	32.18
16	4.88	46	14.03	76	23.18	106	32.33
16½	5.03	46½	14.18	76½	23.33	106½	32.48
17	5.18	47	14.33	77	23.48	107	32.63
17½	5.34	47½	14.49	77½	23.64	107½	32.79
18	5.49	48	14.64	78	23.79	108	32.94
18½	5.64	48½	14.79	78½	23.94	108½	33.09
19	5.79	49	14.94	79	24.09	109	33.24
19½	5.95	49½	15.10	79½	24.25	109½	33.40
20	6.10	50	15.25	80	24.40	110	33.55
20½	6.25	50½	15.40	80½	24.55	110½	33.70
21	6.40	51	15.55	81	24.70	111	33.85
21½	6.56	51½	15.71	81½	24.86	111½	34.01
22	6.71	52	15.86	82	25.01	112	34.16
22½	6.86	52½	16.01	82½	25.16	112½	34.31
23	7.01	53	16.16	83	25.31	113	34.46
23½	7.17	53½	16.32	83½	25.47	113½	34.62
24	7 32	54	16.47	84	25.62	114	34.77
24½	7.47	54½	16.62	84½	25.77	114½	34.92
25	7.62	55	16.77	85	25.92	115	35.07
25½	7.78	55½	16.93	85½	26.08	115½	35.23
26	7.93	56	17.08	86	26.23	116	35.38
26½	8.08	56½	17.23	86½	26.38	116½	35.53
27	8.23	57	17.38	87	26.53	117	35.68
27½	8.39	57½	17.54	87½	26.69	117½	35.84
28	8.54	58	17.69	88	26.84	118	35.99
28½	8.69	58½	17.84	88½	26.99	118½	36.14
29	8.84	59	17.99	89	27.14	119	36.29
29½	9.00	59½	18.15	89½	27.30	119½	36.45
30	9.15	60	18.30	90	27.45	120	36.60

AT 31 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	9.45	60½	18.75	90½	28.05
		31	9.61	61	18.91	91	28.21
		31½	9.76	61½	19.06	91½	28.36
2	0.62	32	9.92	62	19.22	92	28.52
2½	0.77	32½	10.07	62½	19.37	92½	28.67
3	0.93	33	10.23	63	19.53	93	28.83
3½	1.08	33½	10.38	63½	19.68	93½	28.98
4	1.24	34	10.54	64	19.84	94	29.14
4½	1.39	34½	10.69	64½	19.99	94½	29.29
5	1.55	35	10.85	65	20.15	95	29.45
5½	1.70	35½	11.00	65½	20.30	95½	29.60
6	1.86	36	11.16	66	20.46	96	29.76
6½	2.01	36½	11.31	66½	20.61	96½	29.91
7	2.17	37	11.47	67	20.77	97	30.07
7½	2.32	37½	11.62	67½	20.92	97½	30.22
8	2.48	38	11.78	68	21.08	98	30.38
8½	2.63	38½	11.93	68½	21.23	98½	30.53
9	2.79	39	12.09	69	21.39	99	30.69
9½	2.94	39½	12.24	69½	21.54	99½	30.84
10	3.10	40	12.40	70	21.70	100	31.00
10½	3.25	40½	12.55	70½	21.85	100½	31.15
11	3.41	41	12.71	71	22.01	101	31.31
11½	3.56	41½	12.86	71½	22.16	101½	31.46
12	3.72	42	13.02	72	22.32	102	31.62
12½	3.87	42½	13.17	72½	22.47	102½	31.77
13	4.03	43	13.33	73	22.63	103	31.93
13½	4.18	43½	13.48	73½	22.78	103½	32.08
14	4.34	44	13.64	74	22.94	104	32.24
14½	4.49	44½	13.79	74½	23.09	104½	32.39
15	4.65	45	13.95	75	23.25	105	32.55
15½	4.80	45½	14.10	75½	23.40	105½	32.70
16	4.96	46	14.26	76	23.56	106	32.86
16½	5.11	46½	14.41	76½	23.71	106½	33.01
17	5.27	47	14.57	77	23.87	107	33.17
17½	5.42	47½	14.72	77½	24.02	107½	33.32
18	5.58	48	14.88	78	24.18	108	33.48
18½	5.73	48½	15.03	78½	24.33	108½	33.63
19	5.89	49	15.19	79	24.49	109	33.79
19½	6.04	49½	15.34	79½	24.64	109½	33.94
20	6.20	50	15.50	80	24.80	110	34.10
20½	6.35	50½	15.65	80½	24.95	110½	34.25
21	6.51	51	15.81	81	25.11	111	34.41
21½	6.66	51½	15.96	81½	25.26	111½	34.56
22	6.82	52	16.12	82	25.42	112	34.72
22½	6.97	52½	16.27	82½	25.57	112½	34.87
23	7.13	53	16.43	83	25.73	113	35.03
23½	7.28	53½	16.58	83½	25.88	113½	35.18
24	7.44	54	16.74	84	26.04	114	35.34
24½	7.59	54½	16.89	84½	26.19	114½	35.49
25	7.75	55	17.05	85	26.35	115	35.65
25½	7.90	55½	17.20	85½	26.50	115½	35.80
26	8.06	56	17.36	86	26.66	116	35.96
26½	8.21	56½	17.51	86½	26.81	116½	36.11
27	8.37	57	17.67	87	26.97	117	36.27
27½	8.52	57½	17.82	87½	27.12	117½	36.42
28	8.68	58	17.98	88	27.28	118	36.58
28½	8.83	58½	18.13	88½	27.43	118½	36.73
29	8.99	59	18.29	89	27.59	119	36.89
29½	9.14	59½	18.44	89½	27.74	119½	37.04
30	9.30	60	18.60	90	27.90	120	37.20

AT 31½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	9.61	60½	19.06	90½	28.51
		31	9.76	61	19.21	91	28.66
		31½	9.92	61½	19.37	91½	28.82
2	0.63	32	10.08	62	19.53	92	28.98
2½	0.79	32½	10.24	62½	19.69	92½	29.14
3	0.94	33	10.39	63	19.84	93	29.29
3½	1.10	33½	10.55	63½	20.00	93½	29.45
4	1.26	34	10.71	64	20.16	94	29.61
4½	1.42	34½	10.87	64½	20.32	94½	29.77
5	1.57	35	11.02	65	20.47	95	29.92
5½	1.73	35½	11.18	65½	20.63	95½	30.08
6	1.89	36	11.34	66	20.79	96	30.24
6½	2.05	36½	11.50	66½	20.95	96½	30.40
7	2.20	37	11.65	67	21.10	97	30.55
7½	2.36	37½	11.81	67½	21.26	97½	30.71
8	2.52	38	11.97	68	21.42	98	30.87
8½	2.68	38½	12.13	68½	21.58	98½	31.03
9	2.83	39	12.28	69	21.73	99	31.18
9½	2.99	39½	12.44	69½	21.89	99½	31.34
10	3.15	40	12.60	70	22.05	100	31.50
10½	3.31	40½	12.76	70½	22.21	100½	31.66
11	3.46	41	12.91	71	22.36	101	31.81
11½	3.62	41½	13.07	71½	22.52	101½	31.97
12	3.78	42	13.23	72	22.68	102	32.13
12½	3.94	42½	13.39	72½	22.84	102½	32.29
13	4.09	43	13.54	73	22.99	103	32.44
13½	4.25	43½	13.70	73½	23.15	103½	32.60
14	4.41	44	13.86	74	23.31	104	32.76
14½	4.57	44½	14.02	74½	23.47	104½	32.92
15	4.72	45	14.17	75	23.62	105	33.07
15½	4.88	45½	14.33	75½	23.78	105½	33.23
16	5.04	46	14.49	76	23.94	106	33.39
16½	5.20	46½	14.65	76½	24.10	106½	33.55
17	5.35	47	14.80	77	24.25	107	33.70
17½	5.51	47½	14.96	77½	24.41	107½	33.86
18	5.67	48	15.12	78	24.57	108	34.02
18½	5.83	48½	15.28	78½	24.73	108½	34.18
19	5.98	49	15.43	79	24.88	109	34.33
19½	6.14	49½	15.59	79½	25.04	109½	34.49
20	6.30	50	15.75	80	25.20	110	34.65
20½	6.46	50½	15.91	80½	25.36	110½	34.81
21	6.61	51	16.06	81	25.51	111	34.96
21½	6.77	51½	16.22	81½	25.67	111½	35.12
22	6.93	52	16.38	82	25.83	112	35.28
22½	7.09	52½	16.54	82½	25.99	112½	35.44
23	7.24	53	16.69	83	26.14	113	35.59
23½	7.40	53½	16.85	83½	26.30	113½	35.75
24	7.56	54	17.01	84	26.46	114	35.91
24½	7.72	54½	17.17	84½	26.62	114½	36.07
25	7.87	55	17.32	85	26.77	115	36.22
25½	8.03	55½	17.48	85½	26.93	115½	36.38
26	8.19	56	17.64	86	27.09	116	36.54
26½	8.35	56½	17.80	86½	27.25	116½	36.70
27	8.50	57	17.95	87	27.40	117	36.85
27½	8.66	57½	18.11	87½	27.56	117½	37.01
28	8.82	58	18.27	88	27.72	118	37.17
28½	8.98	58½	18.43	88½	27.88	118½	37.33
29	9.13	59	18.58	89	28.03	119	37.48
29½	9.29	59½	18.74	89½	28.19	119½	37.64
30	9.45	60	18.90	90	28.35	120	37.80

AT 32 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	9.76	60½	19.36	90½	28.96
		31	9.92	61	19.52	91	29.12
		31½	10 08	61½	19.68	91½	29.28
2	0.64	32	10.24	62	19.84	92	29.44
2½	0.80	32½	10.40	62½	20.00	92½	29.60
3	0.96	33	10.56	63	20.16	93	29.76
3½	1.12	33½	10.72	63½	20.32	93½	29.92
4	1.28	34	10.88	64	20.48	94	30.08
4½	1.44	34½	11.04	64½	20.64	94½	30.24
5	1.60	35	11.20	65	20.80	95	30.40
5½	1.76	35½	11.36	65½	20.96	95½	30.56
6	1.92	36	11.52	66	21.12	96	30.72
6½	2.08	36½	11.68	66½	21.28	96½	30.88
7	2.24	37	11.84	67	21.44	97	31 04
7½	2.40	37½	12.00	67½	21.60	97½	31.20
8	2.56	38	12.16	68	21.76	98	31.36
8½	2.72	38½	12.32	68½	21.92	98½	31.52
9	2.88	39	12.48	69	22.08	99	31.68
9½	3.04	39½	12.64	69½	22.24	99½	31.84
10	3.20	40	12.80	70	22.40	100	32.00
10½	3.36	40½	12.96	70½	22.56	100½	32.16
11	3.52	41	13.12	71	22.72	101	32.32
11½	3.68	41½	13.28	71½	22.88	101½	32.48
12	3.84	42	13.44	72	23.04	102	32.64
12½	4.00	42½	13.60	72½	23.20	102½	32.80
13	4.16	43	13.76	73	23.36	103	32.96
13½	4.32	43½	13.92	73½	23.52	103½	33.12
14	4.48	44	14.08	74	23.68	104	33.28
14½	4.64	44½	14.24	74½	23.84	104½	33.44
15	4.80	45	14.40	75	24.00	105	33.60
15½	4.96	45½	14.56	75½	24.16	105½	33.76
16	5.12	46	14.72	76	24.32	106	33.92
16½	5.28	46½	14.88	76½	24.48	106½	34.08
17	5.44	47	15.04	77	24.64	107	34.24
17½	5.60	47½	15.20	77½	24.80	107½	34.40
18	5.76	48	15.36	78	24.96	108	34.56
18½	5.92	48½	15.52	78½	25.12	108½	34.72
19	6.08	49	15.68	79	25.28	109	31.88
19½	6.24	49½	15.84	79½	25.44	109½	35.04
20	6.40	50	16.00	80	25.60	110	35.20
20½	6.56	50½	16.16	80½	25.76	110½	35.36
21	6.72	51	16.32	81	25.92	111	35.52
21½	6.88	51½	16.48	81½	26.08	111½	35.68
22	7.04	52	16.64	82	26.24	112	35.84
22½	7.20	52½	16.80	82½	26.40	112½	36.00
23	7.36	53	16.96	83	26.56	113	36.16
23½	7.52	53½	17.12	83½	26.72	113½	36.32
24	7.68	54	17.28	84	26.88	114	36.48
24½	7.84	54½	17.44	84½	27.04	114½	36.64
25	8.00	55	17.60	85	27.20	115	36.80
25½	8.16	55½	17.76	85½	27.36	115½	36.96
26	8.32	56	17.92	86	27.52	116	37.12
26½	8.48	56½	18.08	86½	27.68	116½	37.28
27	8.64	57	18.24	87	27.84	117	37.44
27½	8.80	57½	18.40	87½	28.00	117½	37.60
28	8.96	58	18.56	88	28.16	118	37.76
28½	9.12	58½	18.72	88½	28.32	118½	37.92
29	9.28	59	13.88	89	28.48	119	38.08
29½	9.44	59½	19.04	89½	28.64	119½	38 24
30	9.60	60	19.20	90	28.80	120	38 40

AT 32½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	9.91	60½	19.66	90½	29.41
		31	10.07	61	19.82	91	29.57
		31½	10.24	61½	19.99	91½	29.74
2	0.65	32	10.40	62	20.15	92	29.90
2½	0.81	32½	10.56	62½	20.31	92½	30.06
3	0.97	33	10.72	63	20.47	93	30.22
3½	1.14	33½	10.89	63½	20.64	93½	30.39
4	1.30	34	11.05	64	20.80	94	30.55
4½	1.46	34½	11.21	64½	20.96	94½	30.71
5	1.62	35	11.37	65	21.12	95	30.87
5½	1.79	35½	11.54	65½	21.29	95½	31.04
6	1.95	36	11.70	66	21.45	96	31.20
6½	2.11	36½	11.86	66½	21.61	96½	31.36
7	2.27	37	12.02	67	21.77	97	31.52
7½	2.44	37½	12.19	67½	21.94	97½	31.69
8	2.60	38	12.35	68	22.10	98	31.85
8½	2.76	38½	12.51	68½	22.26	98½	32.01
9	2.92	39	12.67	69	22.42	99	32.17
9½	3.09	39½	12.84	69½	22.59	99½	32.34
10	3.25	40	13.00	70	22.75	100	32.50
10½	3.41	40½	13.16	70½	22.91	100½	32.66
11	3.57	41	13.32	71	23.07	101	32.82
11½	3.74	41½	13.49	71½	23.24	101½	32.99
12	3.90	42	13.65	72	23.40	102	33.15
12½	4.06	42½	13.81	72½	23.56	102½	33.31
13	4.22	43	13.97	73	23.72	103	33.47
13½	4.39	43½	14.14	73½	23.89	103½	33.64
14	4.55	44	14.30	74	24.05	104	33.80
14½	4.71	44½	14.46	74½	24.21	104½	33.96
15	4.87	45	14.62	75	24.37	105	34.12
15½	5.04	45½	14.79	75½	24.54	105½	34.29
16	5.20	46	14.95	76	24.70	106	34.45
16½	5.36	46½	15.11	76½	24.86	106½	34.61
17	5.52	47	15.27	77	25.02	107	34.77
17½	5.69	47½	15.44	77½	25.19	107½	34.94
18	5.85	48	15.60	78	25 35	108	35.10
18½	6.01	48½	15.76	78½	25.51	108½	35.26
19	6.17	49	15.92	79	25.67	109	35.42
19½	6.34	49½	16.09	79½	25.84	109½	35.59
20	6.50	50	16.25	80	26.00	110	35.75
20½	6.66	50½	16.41	80½	26.16	110½	35.91
21	6.82	51	16.57	81	26.32	111	36.07
21½	6.99	51½	16.74	81½	26.49	111½	36.24
22	7.15	52	16.90	82	26.65	112	36 40
22½	7.31	52½	17.06	82½	26.81	112½	36.56
23	7.47	53	17.22	83	26.97	113	36.72
23½	7.64	53½	17.39	83½	27.14	113½	36.89
24	7.80	54	17.55	84	27.30	114	37.05
24½	7.96	54½	17.71	84½	27.46	114½	37 21
25	8.12	55	17.87	85	27.62	115	37.37
25½	8.29	55½	18.04	85½	27.79	115½	37.54
26	8.45	56	18.20	86	27.95	116	37.70
26½	8.61	56½	18.36	86½	28.11	116½	37.86
27	8.77	57	18.52	87	28.27	117	38.02
27½	8.94	57½	18.69	87½	28 44	117½	38 19
28	9.10	58	18.85	88	28.60	118	38.35
28½	9.26	58½	19.01	88½	28.76	118½	38 51
29	9.42	59	19.17	89	28.92	119	38.67
29½	9.59	59½	19.34	89½	29.09	119½	38 84
30	9.75	60	19.50	90	29.25	120	39 00

AT 33 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	10.06	60½	19.96	90½	29.86
		31	10.23	61	20.13	91	30.03
		31½	10.39	61½	20.29	91½	30.19
2	0.66	32	10.56	62	20.46	92	30.36
2½	0.82	32½	10.72	62½	20.62	92½	30.52
3	0.99	33	10.89	63	20.79	93	30.69
3½	1.15	33½	11.05	63½	20.95	93½	30.85
4	1.32	34	11.22	64	21.12	94	31.02
4½	1.48	34½	11.38	64½	21.28	94½	31.18
5	1.65	35	11.55	65	21.45	95	31.35
5½	1.81	35½	11.71	65½	21.61	95½	31.51
6	1.98	36	11.88	66	21.78	96	31.68
6½	2.14	36½	12.04	66½	21.94	96½	31.84
7	2.31	37	12.21	67	22.11	97	32.01
7½	2.47	37½	12.37	67½	22.27	97½	32.17
8	2.64	38	12.54	68	22.44	98	32.34
8½	2.80	38½	12.70	68½	22.60	98½	32.50
9	2.97	39	12.87	69	22.77	99	32.67
9½	3.13	39½	13.03	69½	22.93	99½	32.83
10	3.30	40	13.20	70	23.10	100	33.00
10½	3.46	40½	13.36	70½	23.26	100½	33.16
11	3.63	41	13.53	71	23.43	101	33.33
11½	3.79	41½	13.69	71½	23.59	101½	33.49
12	3.96	42	13.86	72	23.76	102	33.66
12½	4.12	42½	14.02	72½	23.92	102½	33.82
13	4.29	43	14.19	73	24.09	103	33.99
13½	4.45	43½	14.35	73½	24.25	103½	34.15
14	4.62	44	14.52	74	24.42	104	34.32
14½	4.78	44½	14.68	74½	24.58	104½	34.48
15	4.95	45	14.85	75	24.75	105	34.65
15½	5.11	45½	15.01	75½	24.91	105½	34.81
16	5.28	46	15.18	76	25.08	106	34.98
16½	5.44	46½	15.34	76½	25.24	106½	35.14
17	5.61	47	15.51	77	25.41	107	35.31
17½	5.77	47½	15.67	77½	25.57	107½	35.47
18	5.94	48	15.84	78	25.74	108	35.64
18½	6.10	48½	16.00	78½	25.90	108½	35.80
19	6.27	49	16.17	79	26.07	109	35.97
19½	6.43	49½	16.33	79½	26.23	109½	36.13
20	6.60	50	16.50	80	26.40	110	36.30
20½	6.76	50½	16.66	80½	26.56	110½	36.46
21	6.93	51	16.83	81	26.73	111	36.63
21½	7.09	51½	16.99	81½	26.89	111½	36.79
22	7.26	52	17.16	82	27.06	112	36.96
22½	7.42	52½	17.32	82½	27.22	112½	37.12
23	7.59	53	17.49	83	27.39	113	37.29
23½	7.75	53½	17.65	83½	27.55	113½	37.45
24	7.92	54	17.82	84	27.72	114	37.62
24½	8.08	54½	17.98	84½	27.88	114½	37.78
25	8.25	55	18.15	85	28.05	115	37.95
25½	8.41	55½	18.31	85½	28.21	115½	38.11
26	8.58	56	18.48	86	28.38	116	38.28
26½	8.74	56½	18.64	86½	28.54	116½	38.44
27	8.91	57	18.81	87	28.71	117	38.61
27½	9.07	57½	18.97	87½	28.87	117½	38.77
28	9.24	58	19.14	88	29.04	118	38.94
28½	9.40	58½	19.30	88½	29.20	118½	39.10
29	9.57	59	19.47	89	29.37	119	39.27
29½	9.73	59½	19.63	89½	29.53	119½	39.43
30	9.90	60	19.80	90	29.70	120	39.60

AT 33½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	10.22	60½	20.27	90½	30.32
		31	10.38	61	20.43	91	30.48
		31½	10.55	61½	20.60	91½	30.65
2	0.67	32	10.72	62	20.77	92	30.82
2½	0.84	32½	10.89	62½	20.94	92½	30.99
3	1.00	33	11.05	63	21.10	93	31.15
3½	1.17	33½	11.22	63½	21.27	93½	31.32
4	1.34	34	11.39	64	21.44	94	31.49
4½	1.51	34½	11.56	64½	21.61	94½	31.66
5	1.67	35	11.72	65	21.77	95	31.82
5½	1.84	35½	11.89	65½	21.94	95½	31.99
6	2.01	36	12.06	66	22.11	96	32.16
6½	2.18	36½	12.23	66½	22.28	96½	32.33
7	2.34	37	12.39	67	22.44	97	32.49
7½	2.51	37½	12.56	67½	22.61	97½	32.66
8	2.68	38	12.73	68	22.78	98	32.83
8½	2.85	38½	12.90	68½	22.95	98½	33.00
9	3.01	39	13.06	69	23.11	99	33.16
9½	3.18	39½	13.23	69½	23.28	99½	33.33
10	3.35	40	13.40	70	23.45	100	33.50
10½	3.52	40½	13.57	70½	23.62	100½	33.67
11	3.68	41	13.73	71	23.78	101	33.83
11½	3.85	41½	13.90	71½	23.95	101½	34.00
12	4.02	42	14.74	72	24.12	102	34.17
12½	4.19	42½	14.24	72½	24.29	102½	34.34
13	4.35	43	14.40	73	24.45	103	34.50
13½	4.52	43½	14.57	73½	24.62	103½	34.67
14	4.69	44	14.74	74	24.79	104	34.84
14½	4.86	44½	14.91	74½	24.96	104½	35.01
15	5.02	45	15.07	75	25.12	105	35.17
15½	5.19	45½	15.24	75½	25.29	105½	35.34
16	5.36	46	15.41	76	25.46	106	35.51
16½	5.53	46½	15.58	76½	25.63	106½	35.68
17	5.69	47	15.74	77	25.79	107	35.84
17½	5.86	47½	15.91	77½	25.96	107½	36.01
18	6.03	48	16.08	78	26.13	108	36.18
18½	6.20	48½	16.25	78½	26.30	108½	36.35
19	6.36	49	16.41	79	26.46	109	36.51
19½	6.53	49½	16.58	79½	26.63	109½	36.68
20	6.70	50	16.75	80	26.80	110	36.85
20½	6.87	50½	16.92	80½	26.97	110½	37.02
21	7.03	51	17.08	81	27.13	111	37.18
21½	7.20	51½	17.25	81½	27.30	111½	37.35
22	7.37	52	17.42	82	27.47	112	37.52
22½	7.54	52½	17.59	82½	27.64	112½	37.69
23	7.70	53	17.75	83	27.80	113	37.85
23½	7.87	53½	17.92	83½	27.97	113½	38.02
24	8.04	54	18.09	84	28.14	114	38.19
24½	8.21	54½	18.26	84½	28.31	114½	38.36
25	8.37	55	18.42	85	28.47	115	38.52
25½	8.54	55½	18.59	85½	28.64	115½	38.69
26	8.71	56	18.76	86	28.81	116	38.86
26½	8.88	56½	18.93	86½	28.98	116½	39.03
27	9.04	57	19.09	87	29.14	117	39.19
27½	9.21	57½	19.26	87½	29.31	117½	39.36
28	9.38	58	19.43	88	29.48	118	39.53
28½	9.55	58½	19.60	88½	29.65	118½	39.70
29	9.71	59	19.76	89	29.81	119	39.86
29½	9.88	59½	19.93	89½	29.98	119½	40.03
30	10.05	60	20.10	90	30.15	120	40.20

AT 34 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	10.37	60½	20.57	90½	30.77
		31	10.54	61	20.74	91	30.94
		31½	10.71	61½	20.91	91½	31.11
2	0.68	32	10.88	62	21.08	92	31.28
2½	0.85	32½	11.05	62½	21.25	92½	31.45
3	1.02	33	11.22	63	21.42	93	31.62
3½	1.19	33½	11.39	63½	21.59	93½	31.79
4	1.36	34	11.56	64	21.76	94	31.96
4½	1.53	34½	11.73	64½	21.93	94½	32.13
5	1.70	35	11.90	65	22.10	95	32.30
5½	1.87	35½	12.07	65½	22.27	95½	32.47
6	2.04	36	12.24	66	22.44	96	32.64
6½	2.21	36½	12.41	66½	22.61	96½	32.81
7	2.38	37	12.58	67	22.78	97	32.98
7½	2.55	37½	12.75	67½	22.95	97½	33.15
8	2.72	38	12.92	68	23.12	98	33.32
8½	2.89	38½	13.09	68½	23.29	98½	33.49
9	3.06	39	13.26	69	23.46	99	33.66
9½	3.23	39½	13.43	69½	23.63	99½	33.83
10	3.40	40	13.60	70	23.80	100	34.00
10½	3.57	40½	13.77	70½	23.97	100½	34.17
11	3.74	41	13.94	71	24.14	101	34.34
11½	3.91	41½	14.11	71½	24.31	101½	34.51
12	4.08	42	14.28	72	24.48	102	34.68
12½	4.25	42½	14.45	72½	24.65	102½	34.85
13	4.42	43	14.62	73	24.82	103	35.02
13½	4.59	43½	14.79	73½	24.99	103½	35.19
14	4.76	44	14.96	74	25.16	104	35.36
14½	4.93	44½	15.13	74½	25.33	104½	35.53
15	5.10	45	15.30	75	25.50	105	35.70
15½	5.27	45½	15.47	75½	25.67	105½	35.87
16	5.44	46	15.64	76	25.84	106	36.04
16½	5.61	46½	15.81	76½	26.01	106½	36.21
17	5.78	47	15.98	77	26.18	107	36.38
17½	5.95	47½	16.15	77½	26.35	107½	36.55
18	6.12	48	16.32	78	26.52	108	36.72
18½	6.29	48½	16.49	78½	26.69	108½	36.89
19	6.46	49	16.66	79	26.86	109	37.06
19½	6.63	49½	16.83	79½	27.03	109½	37.23
20	6.80	50	17.00	80	27.20	110	37.40
20½	6.97	50½	17.17	80½	27.37	110½	37.57
21	7.14	51	17.34	81	27.54	111	37.74
21½	7.31	51½	17.51	81½	27.71	111½	37.91
22	7.48	52	17.68	82	27.88	112	38.08
22½	7.65	52½	17.85	82½	28.05	112½	38.25
23	7.82	53	18.02	83	28.22	113	38.42
23½		53½	18.19	83½	28.39	113½	38.59
24		54	18.36	84	28.56	114	38.76
		54½	18.53	84½	28.73	114½	38.93
25		55	18.70	85	28.90	115	39.10
25½	8.67	55½	18.87	85½	29.07	115½	39.27
26	8.84	56	19.04	86	29.24	116	39.44
26½	9.01	56½	19.21	86½	29.41	116½	39.61
27	9.18	57	19.38	87	29.58	117	39.78
27½	9.35	57½	19.55	87½	29.75	117½	39.95
28	9.52	58	19.72	88	29.92	118	40.12
28½	9.69	58½	19.89	88½	30.09	118½	40.29
29	9.86	59	20.06	89	30.26	119	40.46
29½	10.03	59½	20.23	89½	30.43	119½	40.63
30	10.20	60	20.40	90	30.60	120	40.80

AT 34½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	10.52	60½	20.87	90½	31.22
		31	10.69	61	21.04	91	31.39
		31½	10.87	61½	21.22	91½	31.57
2	0.69	32	11.04	62	21.39	92	31.74
2½	0.86	32½	11.21	62½	21.56	92½	31.91
3	1.03	33	11.38	63	21.73	93	32.08
3½	1.21	33½	11.56	63½	21.91	93½	32.26
4	1.38	34	11.73	64	22.08	94	32.43
4½	1.55	34½	11.90	64½	22.25	94½	32.60
5	1.72	35	12.07	65	22.42	95	32.77
5½	1.90	35½	12.25	65½	22.60	95½	32.95
6	2.07	36	12.42	66	22.77	96	33.12
6½	2.24	36½	12.59	66½	22.94	96½	33.29
7	2.41	37	12.76	67	23.11	97	33.40
7½	2.59	37½	12.94	67½	23.29	97½	33.64
8	2.76	38	13.11	68	23.46	98	33.81
8½	2.93	38½	13.28	68½	23.63	98½	33.98
9	3.10	39	13.45	69	23.80	99	34.15
9½	3.28	39½	13.63	69½	23.98	99½	34.33
10	3.45	40	13.80	70	24.15	100	34.50
10½	3.62	40½	13.97	70½	24.32	100½	34.67
11	3.79	41	14.14	71	24.49	101	34.84
11½	3.97	41½	14.32	71½	24.67	101½	35.02
12	4.14	42	14.49	72	24.84	102	35.19
12½	4.31	42½	14.66	72½	25.01	102½	35.36
13	4.48	43	14.83	73	25.18	103	35.53
13½	4.66	43½	15.01	73½	25.36	103½	35.71
14	4.83	44	15.18	74	25.53	104	35.88
14½	5.00	44½	15.35	74½	25.70	104½	36.05
15	5.17	45	15.52	75	25.87	105	36.22
15½	5.35	45½	15.70	75½	26.05	105½	36.40
16	5.52	46	15.87	76	26.22	106	36.57
16½	5.69	46½	16.04	76½	26.39	106½	36.74
17	5.86	47	16.22	77	26.56	107	36.91
17½	6.04	47½	16.39	77½	26.74	107½	37.09
18	6.21	48	16.56	78	26.91	108	37.26
18½	6.38	48½	16.73	78½	27.08	108½	37.43
19	6.55	49	16.90	79	27.25	109	37.60
19½	6.73	49½	17.08	79½	27.43	109½	37.78
20	6.90	50	17.25	80	27.60	110	37.95
20½	7.07	50½	17.42	80½	27.77	110½	38.12
21	7.24	51	17.59	81	27.94	111	38.29
21½	7.42	51½	17.77	81½	28.12	111½	38.47
22	7.59	52	17.94	82	28.29	112	38.64
22½	7.76	52½	18.11	82½	28.46	112½	38.81
23	7.93	53	18.28	83	28.63	113	38.98
23½	8.11	53½	18.46	83½	28.81	113½	39.16
24	8.28	54	18.63	84	28.98	114	39.33
24½	8.45	54½	18.80	84½	29.15	114½	39.50
25	8.62	55	18.97	85	29.32	115	39.67
25½	8.80	55½	19.15	85½	29.50	115½	39.85
26	8.97	56	19.32	86	29.67	116	40.02
26½	9.14	56½	19.49	86½	29.84	116½	40.19
27	9.31	57	19.66	87	30.01	117	40.36
27½	9.49	57½	19.84	87½	30.19	117½	40.54
28	9.66	58	20.01	88	30.36	118	40.71
28½	9.83	58½	20.18	88½	30.53	118½	40.88
29	10.00	59	20.35	89	30.70	119	41.05
29½	10.18	59½	20.53	89½	30.88	119½	41.23
30	10.35	60	20.70	90	31.05	120	41.40

AT 35 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	10.67	60½	21.17	90½	31.67
		31	10.85	61	21.35	91	31.85
		31½	11.02	61½	21.52	91½	32.02
2	0.70	32	11.20	62	21.70	92	32.20
2½	0.87	32½	11.37	62½	21.87	92½	32.37
3	1.05	33	11.55	63	22.05	93	32.55
3½	1.22	33½	11.72	63½	22.22	93½	32.72
4	1.40	34	11.90	64	22.40	94	32.90
4½	1.57	34½	12.07	64½	22.57	94½	33.07
5	75	35	12.25	65	22.75	95	33.25
5½	1.92	35½	12.42	65½	22.92	95½	33.42
6	2.10	36	12.60	66	23.10	96	33.60
6½	2.27	36½	12.77	66½	23.27	96½	23.77
7	2.45	37	12.95	67	23.45	97	33.95
7½	2.62	37½	13.12	67½	23.62	97½	34.12
8	2.80	38	13.30	68	23.80	98	34.30
8½	2.97	38½	13.47	68½	23.97	98½	34 47
9	3.15	39	13.65	69	24.15	99	34.65
9½	3.32	39½	13.82	69½	24.32	99½	34.82
10	3.50	40	14.00	70	24.50	100	35.00
10½	3.67	40½	14.17	70½	24.67	100½	35.17
11	3.85	41	14.35	71	24.85	101	35.35
11½	4.02	41½	14.52	71½	25.02	101½	35.52
12	4.20	42	14.70	72	25.20	102	35.70
12½	4.37	42½	14.87	72½	25.37	102½	35.87
13	4.55	43	15.05	73	25.55	103	36.05
13½	4.72	43½	15.22	73½	25.72	103½	36.22
14	4.90	44	15.40	74	25.90	104	36.40
14½	5.07	44½	15.57	74½	26.07	104½	36.57
15	5.25	45	15.75	75	26.25	105	36.75
15½	5.42	45½	15.92	75½	26.42	105½	36.92
16	5.60	46	16.10	76	26.60	106	37.10
16½	5.77	46½	16.27	76½	26.77	106½	37.27
17	5.95	47	16.45	77	26.95	107	37.45
17½	6.12	47½	16.62	77½	27.12	107½	37.62
18	6.30	48	16.80	78	27.30	108	37.80
18½	6.47	48½	16.97	78½	27.47	108½	37.97
19	6.65	49	17.15	79	27.65	109	38.15
19½	6.82	49½	17.32	79½	27.82	109½	38.32
20	7.00	50	17.50	80	28.00	110	38.50
20½	7.17	50½	17.67	80½	28.17	110½	38.67
21	7.35	51	17.85	81	28.35	111	38.85
21½	7.52	51½	18.02	81½	28.52	111½	39.02
22	7.70	52	18.20	82	28.70	112	39.20
22½	7.87	52½	18.37	82½	28.87	112½	39 37
23	8.05	53	18.55	83	29.05	113	39.55
23½	8.22	53½	18.72	83½	29.22	113½	39.72
24	8.40	54	18.90	84	29.40	114	39.90
24½	8.57	54½	19.07	84½	29.57	114½	40.07
25	8.75	55	19.25	85	29.75	115	40.25
25½	8.92	55½	19.42	85½	29.92	115½	40 42
26	9.10	56	19.60	86	30.10	116	40.60
26½	9.27	56½	19.77	86½	30.27	116½	40.77
27	9.45	57	19.95	87	30.45	117	40.95
27½	9.62	57½	20.12	87½	30.62	117½	41.12
28	9.80	58	20.30	88	30.80	118	41.30
28½	9 97	58½	20.47	88½	30.97	118½	41.47
29	10.15	59	20.65	89	31.15	119	41.65
29½	10.32	59½	20.82	89½	31.32	119½	41.82
30	10.50	60	21.00	90	31.50	120	42.00

AT 35½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	10.83	60½	21.48	90½	32.13
		31	11.00	61	21.65	91	32.30
		31½	11.18	61½	21.83	91½	32.48
2	0.71	32	11.36	62	22.01	92	32.66
2½	0.89	32½	11.54	62½	22.19	92½	32.84
3	1.06	33	11.71	63	22.36	93	33.01
3½	1.24	33½	11.89	63½	22.54	93½	33.19
4	1.42	34	12.07	64	22.72	94	33.37
4½	1.60	34½	12.25	64½	22.90	94½	33.55
5	1.77	35	12.42	65	23.07	95	33.72
5½	1.95	35½	12.60	65½	23.25	95½	33.90
6	2.13	36	12.78	66	23.43	96	34.08
6½	2.31	36½	12.96	66½	23.61	96½	34.26
7	2.48	37	13.13	67	23.78	97	34.43
7½	2.66	37½	13.31	67½	23.96	97½	34.61
8	2.84	38	13.49	68	24.14	98	34.79
8½	3.02	38½	13.67	68½	24.32	98½	34.97
9	3.19	39	13.84	69	24.49	99	35.14
9½	3.37	39½	14.02	69½	24.67	99½	35.32
10	3.55	40	14.20	70	24.85	100	35.50
10½	3.73	40½	14.38	70½	25.03	100½	35.68
11	3.90	41	14.55	71	25.20	101	35.85
11½	4.08	41½	14.73	71½	25.38	101½	36.03
12	4.26	42	14.91	72	25.56	102	36.21
12½	4.44	42½	15.09	72½	25.74	102½	36.39
13	4.61	43	15.26	73	25.91	103	36.56
13½	4.79	43½	15.44	73½	26.09	103½	36.74
14	4.97	44	15.62	74	26.27	104	36.92
14½	5.15	44½	15.80	74½	26.45	104½	37.10
15	5.32	45	15.97	75	26.62	105	37.27
15½	5.50	45½	16.15	75½	26.80	105½	37.45
16	5.68	46	16.33	76	26.98	106	37.63
16½	5.86	46½	16.51	76½	27.16	106½	37.81
17	6.03	47	16.68	77	27.33		37.98
17½	6.21	47½	16.86	77½	27.51		38.16
18	6.39	48	17.04	78	27.69		38.34
18½	6.57	48½	17 22	78½	27.87		38.52
19	6.74	49	17.39	79	28.04	109	38.69
19½	6.92	49½	17.57	79½	28.22	109½	38.87
20	7.10	50	17.75	80	28.40	110	39.05
20½	7.28	50½	17.93	80½	28.58	110½	39.23
21	7.45	51	18.10	81	28.75	111	39.40
21½	7.63	51½	18.28	81½	28.93	111½	39.58
22	7.81	52	18.46	82	29.11	112	39.76
22½	7.99	52½	18.64	82½	29.29	112½	39.94
23	8.16	53	18.81	83	29.46	113	40.11
23½	8.34	53½	18.99	83½	29.64	113½	40.29
24	8 52	54	19.17	84	29.82	114	40.47
24½	8.70	54½	19.35	84½	30.00	114½	40.65
25	8.87	55	19.52	85	30.17	115	40.82
25½	9.05	55½	19.70	85½	30.35	115½	41.00
26	9.23	56	19.88	86	30.53	116	41.18
26½	9.41	56½	20.06	86½	30.71	116½	41.36
27	9.58	57	20.23	87	30.88	117	41.53
27½	9.76	57½	20.41	87½	31.06	117½	41.71
28	9.94	58	20.59	88	31.24	118	41.89
28½	10.12	58½	20.77	88½	31.42	118½	42.07
29	10.29	59	20.94	89	31.59	119	42.24
29½	10.47	59½	21.12	89½	31.77	119½	42.42
30	10.65	60	21.30	90	31.95	120	42.60

AT 36 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	10.98	60½	21.78	90½	32.58
		31	11.16	61	21.96	91	32.76
		31½	11.34	61½	22.14	91½	32.94
2	0.72	32	11.52	62	22.32	92	33.12
2½	0.90	32½	11.70	62½	22.50	92½	33.30
3	1.08	33	11.88	63	22.68	93	33.48
3½	1.26	33½	12.06	63½	22.86	93½	33.66
4	1.44	34	12.24	64	23.04	94	33.84
4½	1.62	34½	12.42	64½	23.22	94½	34.02
5	1.80	35	12.60	65	23.40	95	34.20
5½	1.98	35½	12.78	65½	23.58	95½	34.38
6	2.16	36	12.96	66	23.76	96	34.56
6½	2.34	36½	13.14	66½	23.94	96½	34.74
7	2.52	37	13.32	67	24.12	97	34.92
7½	2.70	37½	13.50	67½	24.30	97½	35.10
8	2.88	38	13.68	68	24.48	98	35.28
8½	3.06	38½	13.86	68½	24.66	98½	35.46
9	3.24	39	14.04	69	24.84	99	35.64
9½	3.42	39½	14.22	69½	25.02	99½	35.82
10	3.60	40	14.40	70	25.20	100	36.00
10½	3.78	40½	14.58	70½	25.38	100½	36.18
11	3.96	41	14.76	71	25.56	101	36.36
11½	4.14	41½	14.94	71½	25.74	101½	36.54
12	4.32	42	15.12	72	25.92	102	36.72
12½	4.50	42½	15.30	72½	26.10	102½	36.90
13	4.68	43	15.48	73	26.28	103	37.08
13½	4.86	43½	15.66	73½	26.46	103½	37.26
14	5.04	44	15.84	74	26.64	104	37.44
14½	5.22	44½	16.02	74½	26.82	104½	37.62
15	5.40	45	16.20	75	27.00	105	37.80
15½	5.58	45½	16.38	75½	27.18	105½	37.98
16	5.76	46	16.56	76	27.36	106	38.16
16½	5.94	46½	16.74	76½	27.54	106½	38.34
17	6.12	47	16.92	77	27.72	107	38.52
17½	6.30	47½	17.10	77½	27.90	107½	38.70
18	6.48	48	17.28	78	28.08	108	38.88
18½	6.66	48½	17.46	78½	28.26	108½	39.06
19	6.84	49	17.64	79	28.44	109	39.24
19½	7.02	49½	17.82	79½	28.62	109½	39.42
20	7.20	50	18.00	80	28.80	110	39.60
20½	7.38	50½	18.18	80½	28.98	110½	39.78
21	7.56	51	18.36	81	29.16	111	39.96
21½	7.74	51½	18.54	81½	29.34	111½	40.14
22	7.92	52	18.72	82	29.52	112	40.32
22½	8.10	52½	18.90	82½	29.70	112½	40.50
23	8.28	53	19.08	83	29.88	113	40.68
23½	8.46	53½	19.26	83½	30.06	113½	40.86
24	8.64	54	19.44	84	30.24	114	41.04
24½	8.82	54½	19.62	84½	30.42	114½	41.22
25	9.00	55	19.80	85	30.60	115	41.40
25½	9.18	55½	19.98	85½	30.78	115½	41.58
26	9.36	56	20.16	86	30.96	116	41.76
26½	9.54	56½	20.34	86½	31.14	116½	41.94
27	9.72	57	20.52	87	31.32	117	42.12
27½	9.90	57½	20.70	87½	31.50	117½	42.30
28	10.08	58	20.88	88	31.68	118	42.48
28½	10.26	58½	21.06	88½	31.86	118½	42.66
29	10.44	59	21.24	89	32.04	119	42.84
29½	10.62	59½	21.42	89½	32.22	119½	43.02
30	10.80	60	21.60	90	32.40	120	43.20

AT 36½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	11.13	60½	22.08	90½	33.03
		31	11.31	61	22.26	91	33.21
		31½	11.50	61½	22.45	91½	33.40
2	0.73	32	11.68	62	22.63	92	33.58
2½	0.91	32½	11.86	62½	22.81	92½	33.76
3	1.09	33	12.04	63	22.99	93	33.94
3½	1.28	33½	12.23	63½	23.18	93½	34.13
4	1.46	34	12.41	64	23.36	94	34.31
4½	1.64	34½	12.59	64½	23.54	94½	34.49
5	1.82	35	12.77	65	23.72	95	34.67
5½	2.01	35½	12.96	65½	23.91	95½	34.86
6	2.19	36	13.14	66	24.09	96	35.04
6½	2.37	36½	13.32	66½	24.27	96½	35.22
7	2.55	37	13.50	67	24.45	97	35.40
7½	2.74	37½	13.69	67½	24.64	97½	35.59
8	2.92	38	13.87	68	24.82	98	35.77
8½	3.10	38½	14.05	68½	25.00	98½	35.95
9	3.28	39	14.23	69	25.18	99	36.13
9½	3.47	39½	14.42	69½	25.37	99½	36.32
10	3.65	40	14.60	70	25.55	100	36.50
10½	3.83	40½	14.78	70½	25.73	100½	36.68
11	4.01	41	14.96	71	25.91	101	36.86
11½	4.20	41½	15.15	71½	26.10	101½	37.05
12	4.38	42	15.33	72	26.28	102	37.23
12½	4.56	42½	15.51	72½	26.46	102½	37.41
13	4.74	43	15.69	73	26.64	103	37.59
13½	4.93	43½	15.88	73½	26.83	103½	37.78
14	5.11	44	16.06	74	27.01	104	37.96
14½	5.29	44½	16.24	74½	27.19	104½	38.14
15	5.47	45	16.42	75	27.37	105	38.32
15½	5.66	45½	16.61	75½	27.56	105½	38.51
16	5.84	46	16.79	76	27.74	106	38.69
16½	6.02	46½	16.97	76½	27.92	106½	38.87
17	6.20	47	17.15	77	28.10	107	39.05
17½	6.39	47½	17.34	77½	28.29	107½	39.24
18	6.57	48	17.52	78	28.47	108	39.42
18½	6.75	48½	17.70	78½	28.65	108½	39.60
19	6.93	49	17.88	79	28.83	109	39.78
19½	7.12	49½	18.07	79½	29.02	109½	39.97
20	7.30	50	18.25	80	29.20	110	40.15
20½	7.48	50½	18.43	80½	29.38	110½	40.33
21	7.66	51	18.61	81	29.56	111	40.51
21½	7.85	51½	18.80	81½	29.75	111½	40.70
22	8.03	52	18.98	82	29.93	112	40.88
22½	8.21	52½	19.16	82½	30.11	112½	41.06
23	8.39	53	19.34	83	30.29	113	41.24
23½	8.58	53½	19.53	83½	30.48	113½	41.43
24	8.76	54	19.71	84	30.66	114	41.61
24½	8.94	54½	19.89	84½	30.84	114½	41.79
25	9.12	55	20.07	85	31.02	115	41.97
25½	9.31	55½	20.26	85½	31.21	115½	42.16
26	9.49	56	20.44	86	31.39	116	42.34
26½	9.67	56½	20.62	86½	31.57	116½	42.52
27	9.85	57	20.80	87	31.75	117	42.70
27½	10.04	57½	20.99	87½	31.94	117½	42.89
28	10.22	58	21.17	88	32.12	118	43.07
28½	10.40	58½	21.35	88½	32.30	118½	43.25
29	10.58	59	21.53	89	32.48	119	43.43
29½	10.77	59½	21.72	89½	32.67	119½	43.62
30	10.95	60	21.90	90	32.85	120	43.80

AT 37 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	11.28	60½	22.38	90½	33.48
		31	11.47	61	22.57	91	33.67
		31½	11.65	61½	22.75	91½	33.85
2	0.74	32	11.84	62	22.94	92	34.04
	0.92	32½	12.02	62½	23.12	92½	34.22
	1.11	33	12.21	63	23.31	93	34.41
	1.29	33½	12.39	63½	23.49	93½	34.59
	1.48	34	12.58	64	23.68	94	34.78
	1.66	34½	12.76	64½	23.86	94½	34 96
5	1.85	35	12.95	65	24.05	95	35.15
5½	2.03	35½	13.13	65½	24.23	95½	35.33
6	2.22	36	13.32	66	24.42	96	35.52
6½	2.40	36½	13.50	66½	24.60	96½	35.70
7	2.59	37	13.69	67	24.79	97	35.89
7½	2.77	37½	13.87	67½	24.97	97½	36.07
8	2.96	38	14.06	68	25.16	98	36.26
8½	3.14	38½	14.24	68½	25.34	98½	36.44
9	3.33	39	14.43	69	25.53	99	36.63
9½	3.51	39½	14.61	69½	25.71	99½	36.81
10	3.70	40	14.80	70	25.90	100	37.00
10½	3.88	40½	14.98	70½	26.08	100½	37.18
11	4.07	41	15.17	71	26.27	101	37.37
11½	4.25	41½	15.35	71½	26.45	101½	37.55
12	4.44	42	15.54	72	26.64	102	37.74
12½	4.62	42½	15.72	72½	26.82	102½	37.92
13	4.81	43	15.91	73	27.01	103	38.11
13½	4.99	43½	16.09	73½	27.19	103½	38.29
14	5.18	44	16.28	74	27.38	104	38.48
14½	5.36	44½	16.46	74½	27.56	104½	38.66
15	5.55	45	16.65	75	27.75	105	38.85
15½	5.73	45½	16.83	75½	27.93	105½	39.03
16	5.92	46	17.02	76	28.12	106	39.22
16½	6.10	46½	17.20	76½	28.30	106½	39.40
17	6.29	47	17.39	77	28.49	107	39.59
17½	6.47	47½	17.57	77½	28.67	107½	39.77
18	6.66	48	17.76	78	28.86	108	39.96
18½	6.84	48½	17.94	78½	29.04	108½	40.14
19	7.03	49	18.13	79	29.23	109	40.33
19½	7.21	49½	18.31	79½	29.41	109½	40.51
20	7.40	50	18.50	80	29.60	110	40.70
20½	7.58	50½	18.68	80½	29.78	110½	40.88
21	7.77	51	18.87	81	29.97	111	41.07
21½	7.95	51½	19.05	81½	30.15	111½	41.25
22	8.14	52	19.24	82	30.34	112	41.44
22½	8.32	52½	19.42	82½	30.52	112½	41.62
23	8.51	53	19.61	83	30.71	113	41.81
23½	8.69	53½	19.79	83½	30.89	113½	41.99
24	8.88	54	19.98	84	31.08	114	42.18
	9.06	54½	20.16	84½	31.26	114½	42.36
25	9.25	55	20.35	85	31.45	115	42.55
25½	9.43	55½	20.53	85½	31.63	115½	42.73
26	9.62	56	20.72	86	31.82	116	42.92
	9.80	56½	20.90	86½	32.00	116½	43.10
	9.99	57	21.09	87	32.19	117	43.29
27	10.17	57½	21.27	87½	32.37	117½	43.47
28	10.36	58	21.46	88	32.56	118	43.66
28½	10.54	58½	21.64	88½	32.74	118½	43.84
29	10.73	59	21.83	89	32.93	119	44.03
29½	10.91	59½	22.01	89½	33.11	119½	44.21
30	11.10	60	22.20	90	33.30	120	44.40

AT 37½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	11.44	60½	22.69	90½	33.94
		31	11.62	61	22.87	91	34.12
		31½	11.81	61½	23.06	91½	34.31
2	0.75	32	12.00	62	23.25	92	34.50
2½	0.94	32½	12.19	62½	23.44	92½	34.69
3	1.12	33	12.37	63	23.62	93	34.87
3½	1.31	33½	12.56	63½	23.81	93½	35.06
4	1.50	34	12.75	64	24.00	94	35.25
4½	1.69	34½	12.94	64½	24.19	94½	35.44
5	1.87	35	13.12	65	24.37	95	35.62
5½	2.06	35½	13.31	65½	24.56	95½	35.81
6	2.25	36	13.50	66	24.75	96	36.00
6½	2.44	36½	13.69	66½	24.94	96½	36.19
7	2.62	37	13.87	67	25.12	97	36.37
7½	2.81	37½	14.06	67½	25.31	97½	36.56
8	3.00	38	14.25	68	25.50	98	36.75
8½	3.19	38½	14.44	68½	25.69	98½	36.94
9	3.37	39	14.62	69	25.87	99	37.12
9½	3.56	39½	14.81	69½	26.06	99½	37.31
10	3.75	40	15.00	70	26.25	100	37.50
10½	3.94	40½	15.19	70½	26.44	100½	37.69
11	4.12	41	15.37	71	26.62	101	37.87
11½	4.31	41½	15.56	71½	26.81	101½	38.06
12	4.50	42	15.75	72	27.00	102	38.25
12½	4.69	42½	15.94	72½	27.19	102½	38.44
13	4.87	43	16.12	73	27.37	103	38.62
13½	5.06	43½	16.31	73½	27.56	103½	38.81
14	5.25	44	16.50	74	27.75	104	39.00
14½	5.44	44½	16.69	74½	27.94	104½	39.19
15	5.62	45	16.87	75	28.12	105	39.37
15½	5.81	45½	17.06	75½	28.31	105½	39.56
16	6.00	46	17.25	76	28.50	106	39.75
16½	6.19	46½	17.44	76½	28.69	106½	39.94
17	6.37	47	17.62	77	28.87	107	40.12
17½	6.56	47½	17.81	77½	29.06	107½	40.31
18	6.75	48	18.00	78	29.25	108	40 50
18½	6.94	48½	18.19	78½	29.44	108½	40.69
19	7.12	49	8.37	79	29.62	109	40.87
19½	7.31	49½	18.56	79½	29.81	109½	41.06
20	7 50	50	18.75	80	30.00	110	41.25
20½	7.69	50½	18.94	80½	30.19	110½	41.44
21	7.87	51	19.12	81	30.37	111	41.62
21½	8.06	51½	19.31	81½	30.56	111½	41.81
22	8.25	52	19.50	82	30.75	112	42.00
22½	8.44	52½	19.69	82½	30.94	112½	42.19
23	8.62	53	19.87	83	31.12	113	42.37
23½	8.81	53½	20.06	83½	31.31	113½	42 50
24	9.00	54	20.25	84	31.50	114	42.75
24½	9.10	54½	0.44	84½	31.69	114½	42.94
25	9.37	55	20.62	85	31.87	115	43.12
25½	9.56	55½	20.81	85½	32.06	115½	43.31
26	9.75	56	21.00	86	32.25	116	43.50
26½	9.94	56½	21.19	86½	32.44	116½	43.69
27	10.12	57	21.37	87	32.62	117	43.87
27½	10.31	57½	21.56	87½	32.81	117½	44.06
28	10.50	58	21.75	88	33.00	118	44.25
28½	10.69	58½	21.94	88½	33.19	118½	44.44
29	10.87	59	22.12	89	33.37	119	44.62
29½	11.06	59½	22.31	89½	33.56	119½	44.81
30	11.25	60	22.50	90	33.75	120	45.00

AT 38 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	11.59	60½	22.99	90½	34.39
		31	11.78	61	23.18	91	34.58
		31½	11.97	61½	23.37	91½	34.77
2	0.76	32	12.16	62	23.56	92	34.96
2½	0.95	32½	12.35	62½	23.75	92½	35.15
3	1.14	33	12.54	63	23.94	93	35.34
3½	1.33	33½	12.73	63½	24.13	93½	35.53
4	1.52	34	12.92	64	24.32	94	35.72
4½	1.71	34½	13.11	64½	24.51	94½	35.91
5	1.90	35	13.30	65	24.70	95	36.10
5½	2.09	35½	13.49	65½	24.89	95½	36.29
6	2.28	36	13.68	66	25.08	96	36.48
6½	2.47	36½	13.87	66½	25.27	96½	36.67
7	2.66	37	14.06	67	25.46	97	36.86
7½	2.85	37½	14.25	67½	25.65	97½	37.05
8	3.04	38	14.44	68	25.84	98	37.24
8½	3.23	38½	14.63	68½	26.03	98½	37.43
9	3.42	39	14.82	69	26.22	99	37.62
9½	3.61	39½	15.01	69½	26.41	99½	37.81
10	3.80	40	15.20	70	26.60	100	38.00
10½	3.99	40½	15.39	70½	26.79	100½	38.19
11	4.18	41	15.58	71	26.98	101	38.38
11½	4.37	41½	15.77	71½	27.17	101½	38.57
12	4.56	42	15.96	72	27.36	102	38.76
12½	4.75	42½	16.15	72½	27.55	102½	38.95
13	4.94	43	16.34	73	27.74	103	39.14
13½	5.13	43½	16.53	73½	27.93	103½	39.33
14	5.32	44	16.72	74	28.12	104	39.52
14½	5.51	44½	16.91	74½	28.31	104½	39.71
15	5.70	45	17.10	75	28.50	105	39.90
15½	5.89	45½	17.29	75½	28.69	105½	40.09
16	6.08	46	17.48	76	28.88	106	40.28
16½	6.27	46½	17.67	76½	29.07	106½	40.47
17	6.46	47	17.86	77	29.26	107	40.66
17½	6.65	47½	18.05	77½	29.45	107½	40.85
18	6.84	48	18.24	78	29.64	108	41.04
18½	7.03	48½	18.43	78½	29.83	108½	41.23
19	7.22	49	18.62	79	30.02	109	41.42
19½	7.41	49½	18.81	79½	30.21	109½	41.61
20	7.60	50	19.00	80	30.40	110	41.80
20½	7.79	50½	19.19	80½	30.59	110½	41.99
21	7.98	51	19.38	81	30.78	111	42.18
21½	8.17	51½	19.57	81½	30.97	111½	42.37
22	8.36	52	19.76	82	31.16	112	42.56
22½	8.55	52½	19.95	82½	31.35	112½	42.75
23	8.74	53	20.14	83	31.54	113	42.94
23½	8.93	53½	20.33	83½	31.73	113½	43.13
24	9.12	54	20.52	84	31.92	114	43.32
24½	9.31	54½	20.71	84½	32.11	114½	43.51
25	9.50	55	20.90	85	32.30	115	43.70
25½	9.69	55½	21.09	85½	32.49	115½	43.89
26	9.88	56	21.28	86	32.68	116	44.08
26½	10.07	56½	21.47	86½	32.87	116½	44.27
27	10.26	57	21.66	87	33.06	117	44.46
27½	10.45	57½	21.85	87½	33.25	117½	44.65
28	10.64	58	22.04	88	33.44	118	44.84
28½	10.83	58½	22.23	88½	33.63	118½	45.03
29	11.02	59	22.42	89	33.82	119	45.22
29½	11.21	59½	22.61	89½	34.01	119½	45.41
30	11.40	60	22.80	90	34.20	120	45.60

AT 38½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	11.74	60½	23.29	90½	34.84
		31	11.93	61	23.48	91	35.03
		31½	12.13	61½	23.68	91½	35.23
2	0.77	32	12.32	62	23.87	92	35.42
2½	0.96	32½	12.51	62½	24.06	92½	35.61
3	1.15	33	12.70	63	24.25	93	35.80
3½	1.35	33½	12.90	63½	24.45	93½	36.00
4	1.54	34	13.09	64	24.64	94	36.19
4½	1.73	34½	13.28	64½	24.83	94½	36.38
5	1.92	35	13.47	65	25.02	95	36.57
5½	2.12	35½	13.67	65½	25.22	95½	36.77
6	2.31	36	13.86	66	25.41	96	36.96
6½	2.50	36½	14.05	66½	25.60	96½	37.15
7	2.69	37	14.24	67	25.79	97	37.34
7½	2.89	37½	14.44	67½	25.99	97½	37.54
8	3.08	38	14.63	68	26.18	98	37.73
8½	3.27	38½	14.82	68½	26.37	98½	37.92
9	3.46	39	15.01	69	26.56	99	38.11
9½	3.66	39½	15.21	69½	26.76	99½	38.31
10	3.85	40	15.40	70	26.95	100	38.50
10½	4.04	40½	15.59	70½	27.14	100½	38.69
11	4.23	41	15.78	71	27.33	101	38.88
11½	4.43	41½	15.98	71½	27.53	101½	39.08
12	4.62	42	16.17	72	27.72	102	39.27
12½	4.81	42½	16.36	72½	27.91	102½	39.46
13	5.00	43	16.55	73	28.10	103	39.65
13½	5.20	43½	16.75	73½	28.30	103½	39.85
14	5.39	44	16.94	74	28.49	104	40.04
14½	5.58	44½	17.13	74½	28.68	104½	40.23
15	5.77	45	17.32	75	28.87	105	40.42
15½	5.97	45½	17.52	75½	29.07	105½	40.62
16	6.16	46	17.71	76	29.26	106	40.81
16½	6.35	46½	17.90	76½	29.45	106½	41.00
17	6.54	47	18.09	77	29.64	107	41.19
17½	6.74	47½	18.29	77½	29.84	107½	41.39
18	6.93	48	18.48	78	30.03	108	41.58
18½	7.12	48½	18.67	78½	30.22	108½	41.77
19	7.31	49	18.86	79	30.41	109	41.96
19½	7.51	49½	19.06	79½	30.61	109½	42.16
20	7.70	50	19.25	80	30.80	110	42.35
20½	7.89	50½	19.44	80½	30.99	110½	42.54
21	8.08	51	19.63	81	31.18	111	42.73
21½	8.28	51½	19.83	81½	31.38	111½	42.93
22	8.47	52	20.02	82	31.57	112	43.12
22½	8.66	52½	20.21	82½	31.76	112½	43.31
23	8.85	53	20.40	83	31.95	113	43.50
23½	9.05	53½	20.60	83½	32.15	113½	43.70
24	9.24	54	20.79	84	32.34	114	43.89
24½	9.43	54½	20.98	84½	32.53	114½	44.08
25	9.62	55	21.17	85	32.72	115	44.27
25½	9.82	55½	21.37	85½	32.92	115½	44.47
26	10.01	56	21.56	86	33.11	116	44.66
26½	10.20	56½	21.75	86½	33.30	116½	44.85
27	10.39	57	21.94	87	33.49	117	45.04
27½	10.59	57½	22.14	87½	33.69	117½	45.24
28	10.78	58	22.33	88	33.88	118	45.43
28½	10.97	58½	22.52	88½	34.07	118½	45.62
29	11.16	59	22.71	89	34.26	119	45.81
29½	11.36	59½	22.91	89½	34.46	119½	46.01
30	11.55	60	23.10	90	34.65	120	46.20

AT 39 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	11.89	60½	23.59	90½	35.29
		31	12.09	61	23.79	91	35.49
		31½	12.28	61½	23.98	91½	35.68
2	0.78	32	12.48	62	24.18	92	35.88
2½	0.97	32½	12.67	62½	24.37	92½	36.07
3	1.17	33	12.87	63	24.57	93	36.27
3½	1.36	33½	13.06	63½	24.76	93½	36.46
4	1.56	34	13.26	64	24.96	94	36.66
4½	1.75	34½	13.45	64½	25.15	94½	36.85
5	1.95	35	13.65	65	25.35	95	37.05
5½	2.14	35½	13.84	65½	25.54	95½	37.24
6	2.34	36	14.04	66	25.74	96	37.44
6½	2.53	36½	14.23	66½	25.93	96½	37.63
7	2.73	37	14.43	67	26.13	97	37.83
7½	2.92	37½	14.62	67½	26.32	97½	38.02
8	3.12	38	14.82	68	26.52	98	38.22
8½	3.31	38½	15.01	68½	26.71	98½	38.41
9	3.51	39	15.21	69	26.91	99	38.61
9½	3.70	39½	15.40	69½	27.10	99½	38.80
10	3.90	40	15.60	70	27.30	100	39.00
10½	4.09	40½	15.79	70½	27.49	100½	39.19
11	4.29	41	15.99	71	27.69	101	39.39
11½	4.48	41½	16.18	71½	27.88	101½	39.58
12	4.68	42	16.38	72	28.08	102	39.78
12½	4.87	42½	16.57	72½	28.27	102½	39.97
13	5.07	43	16.77	73	28.47	103	40.17
13½	5.26	43½	16.96	73½	28.66	103½	40.36
14	5.46	44	17.16	74	28.86	104	40.56
14½	5.65	44½	17.35	74½	29.05	104½	40.75
15	5.85	45	17.55	75	29.25	105	40.95
15½	6.04	45½	17.74	75½	29.44	105½	41.14
16	6.24	46	17.94	76	29.64	106	41.34
16½	6.43	46½	18.13	76½	29.83	106½	41.53
17	6.63	47	18.33	77	30.03	107	41.73
17½	6.82	47½	18.52	77½	30.22	107½	41.92
18	7.02	48	18.72	78	30.42	108	42.12
18½	7.21	48½	18.91	78½	30.61	108½	42.31
19	7.41	49	19.11	79	30.81	109	42.51
19½	7.60	49½	19.30	79½	31.00	109½	42.70
20	7.80	50	19.50	80	31.20	110	42.90
20½	7.99	50½	19.69	80½	31.39	110½	43.09
21	8.19	51	19.89	81	31.59	111	43.29
21½	8.38	51½	20.08	81½	31	111½	43.48
22	8.58	52	20.28	82	31.98	112	43.68
22½	8.77	52½	20.47	82½	32.17	112½	43.87
23	8.97	53	20.67	83	32.37	113	44.07
23½	9.16	53½	20.86	83½	32.56	113½	44.26
24	9.36	54	21.06	84	32.76	114	44.46
24½	9.55	54½	21.25	84½	32.95	114½	44.65
25	9.75	55	21.45	85	33.15	115	44.85
25½	9.94	55½	21.64	85½	33.34	115½	45.04
26	10.14	56	21.84	86	33.54	116	45.24
26½	10.33	56½	22.03	86½	33.73	116½	45.43
27	10.53	57	22.23	87	33.93	117	45.63
27½	10.72	57½	22.42	87½	34.12	117½	45.82
28	10.92	58	22.62	88	34.32	118	46.02
28½	11.11	58½	22.81	88½	34.51	118½	46.21
29	11.31	59	23.01	89	34.71	119	46.41
29½	11.50	59½	23.20	89½	34.90	119½	46.60
30	11.70	60	23.40	90	35.10	120	46.80

AT 39½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	12.05	60½	23.90	90½	35.75
		31	12.24	61	24.09	91	35.94
		31½	12.44	61½	24.29	91½	36.14
2	0.79	32	12.64	62	24.49	92	36.34
2½	0.99	32½	12.84	62½	24.69	92½	36.54
3	1.18	33	13.03	63	24.88	93	36.73
3½	1.38	33½	13.23	63½	25.08	93½	36.93
4	1.58	34	13.43	64	25.28	94	37.13
4½	1.78	34½	13.63	64½	25.48	94½	37.33
5	1.97	35	13.82	65	25.67	95	37.52
5½	2.17	35½	14.02	65½	25.87	95½	37.72
6	2.37	36	14.22	66	26.07	96	37.92
6½	2.57	36½	14.42	66½	26.27	96½	38.12
7	2.76	37	14.61	67	26.46	97	38.31
7½	2.96	37½	14.81	67½	26.66	97½	38.51
8	3.16	38	15.01	68	26.86	98	38.71
8½	3.36	38½	15.21	68½	27.06	98½	38.91
9	3.55	39	15.40	69	27.25	99	39.10
9½	3.75	39½	15.60	69½	27.45	99½	39.30
10	3.95	40	15.80	70	27.65	100	39.50
10½	4.15	40½	16.00	70½	27.85	100½	39.70
11	4.34	41	16.19	71	28.04	101	39.99
11½	4.54	41½	16.39	71½	28.24	101½	40.09
12	4.74	42	16.59	72	28.44	102	40.29
12½	4.94	42½	16.79	72½	28.64	102½	40.49
13	5.13	43	16.98	73	28.83	103	40.68
13½	5.33	43½	17.18	73½	29.03	103½	40.88
14	5.53	44	17.38	74	29.23	104	41.08
14½	5.73	44½	17.58	74½	29.43	104½	41.28
15	5.92	45	17.77	75	29.62	105	41.47
15½	6.12	45½	17.97	75½	29.82	105½	41.67
16	6.32	46	18.17	76	30.02	106	41.87
16½	6.52	46½	18.37	76½	30.22	106½	42.07
17	6.71	47	18.56	77	30.41	107	42.26
17½	6.91	47½	18.76	77½	30.61	107½	42.46
18	7.11	48	18.96	78	30.81	108	42.66
18½	7.31	48½	19.16	78½	31.01	108½	42.86
19	7.50	49	19.35	79	31.20	109	43.05
19½	7.70	49½	19.55	79½	31.40	109½	43.25
20	7.90	50	19.75	80	31.60	110	43.45
20½	8.10	50½	19.95	80½	31.80	110½	43.65
21	8.29	51	20.14	81	32.09	111	43.84
21½	8.49	51½	20.34	81½	32.19	111½	44.04
22	8.69	52	20.54	82	32.39	112	44.24
22½	8.89	52½	20.74	82½	32.59	112½	44.44
23	9.08	53	20.93	83	32.78	113	44.63
23½	9.28	53½	21.13	83½	32.98	113½	44.83
24	9.48	54	21.33	84	33.18	114	45.03
24½	9.68	54½	21.53	84½	33.38	114½	45.23
25	9.87	55	21.72	85	33.57	115	45.42
25½	10.07	55½	21.92	85½	33.77	115½	45.62
26	10.27	56	22.12	86	33.97	116	45.82
26½	10.47	56½	22.32	86½	34.17	116½	46.02
27	10.66	57	22.51	87	34.36	117	46.21
27½	10.86	57½	22.71	87½	34.56	117½	46.41
28	11.06	58	22.91	88	34.76	118	46.61
28½	11.26	58½	23.11	88½	34.96	118½	46.81
29	11.45	59	23.30	89	35.15	119	47.00
29½	11.65	59½	23.50	89½	35.35	119½	47.20
30	11.85	60	23.70	90	35.55	120	47.40

AT 40 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	12.20	60½	24.20	90½	36.20
		31	12.40	61	24.40	91	36.40
		31½	12.60	61½	24.60	91½	36.60
2	0.80	32	12.80	62	24.80	92	36.80
2½	1.00	32½	13.00	62½	25.00	92½	37.00
3	1.20	33	13.20	63	25.20	93	37.20
3½	1.40	33½	13.40	63½	25.40	93½	37.40
4	1.60	34	13.60	64	25.60	94	37.60
4½	1.80	34½	13.80	64½	25.80	94½	37.80
5	2.00	35	14.00	65	26.00	95	38.00
5½	2.20	35½	14.20	65½	26.20	95½	38.20
6	2.40	36	14.40	66	26.40	96	38.40
6½	2.60	36½	14.60	66½	26.60	96½	38.60
7	2.80	37	14.80	67	26.80	97	38.80
7½	3.00	37½	15.00	67½	27.00	97½	39.00
8	3.20	38	15.20	68	27.20	98	39.20
8½	3.40	38½	15.40	68½	27.40	98½	39.40
9	3.60	39	15.60	69	27.60	99	89.60
9½	3.80	39½	15.80	69½	27.80	99½	39.80
10	4.00	40	16.00	70	28.00	100	40.00
10½	4.20	40½	16.20	70½	28.20	100½	40.20
11	4.40	41	16.40	71	28.40	101	40.40
11½	4.60	41½	16.60	71½	28.60	101½	40.60
12	4.80	42	16.80	72	28.80	102	40.80
12½	5.00	42½	17.00	72½	29.00	102½	41.00
13	5.20	43	17.20	73	29.20	103	41.20
13½	5.40	43½	17.40	73½	29.40	103½	41.40
14	5.60	44	17.60	74	29.60	104	41.60
14½	5.80	44½	17.80	74½	29.80	104½	41.80
15	6.00	45	18.00	75	30.00	105	42.00
15½	6.20	45½	18.20	75½	30.20	105½	42.20
16	6.40	46	18.40	76	30.40	106	42.40
16½	6.60	46½	18.60	76½	30.60	106½	42.60
17	6.80	47	18.80	77	30.80	107	42.80
17½	7.00	47½	19.00	77½	31.00	107½	43.00
18	7.20	48	19.20	78	31.20	108	43.20
18½	7.40	48½	19.40	78½	31.40	108½	43.40
19	7.60	49	19.60	79	31.60	109	43.60
19½	7.80	49½	19.80	79½	31.80	109½	43.80
20	8.00	50	20.00	80	32.00	110	44.00
20½	8.20	50½	20.20	80½	32.20	110½	44.20
21	8.40	51	20.40	81	32.40	111	44.40
21½	8.60	51½	20.60	81½	32.60	111½	44.60
22	8.80	52	20.80	82	32.80	112	44.80
22½	9.00	52½	21.00	82½	33.00	112½	45.00
23	9.20	53	21.20	83	33.20	113	45.20
23½	9.40	53½	21.40	83½	33.40	113½	45.40
24	9.60	54	21.60	84	33.60	114	45.60
24½	9.80	54½	21.80	84½	33.80	114½	45.80
25	10.00	55	22.00	85	34.00	115	46.00
25½	10.20	55½	22.20	85½	34.20	115½	46.20
26	10.40	56	22.40	86	34.40	116	46.40
26½	10.60	56½	22.60	86½	34.60	116½	46.60
27	10.80	57	22.80	87	34.80	117	46.80
27½	11.00	57½	23.00	87½	35.00	117½	47.00
28	11.20	58	23.20	88	35.20	118	47.20
28½	11.40	58½	23.40	88½	35.40	118½	47.40
29	11.60	59	23.60	89	35.60	119	47.60
29½	11.80	59½	23.80	89½	35.80	119½	47.80
30	12.00	60	24.00	90	36.00	120	48.00

AT 40½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	12.35	60½	24.50	90½	36.65
		31	12.55	61	24.70	91	36.85
		31½	12.76	61½	24.91	91½	37.06
2	0.81	32	12.96	62	25.11	92	37.26
2½	1.01	32½	13.16	62½	25.31	92½	37.46
3	1.21	33	13.36	63	25.51	93	37.66
3½	1.42	33½	13.57	63½	25.72	93½	37.87
4	1.62	34	13.77	64	25.92	94	38.07
4½	1.82	34½	13.97	64½	26.12	94½	38.27
5	2.02	35	14.17	65	26.32	95	38.47
5½	2.23	35½	14.38	65½	26.53	95½	38.68
6	2.43	36	14.58	66	26.73	96	38.88
6½	2.63	36½	14.78	66½	26.93	96½	39.08
7	2.83	37	14.98	67	27.13	97	39.28
7½	3.04	37½	15.19	67½	27.34	97½	39.49
8	3.24	38	15.39	68	27.54	98	39.69
8½	3.44	38½	15.59	68½	27.74	98½	39.89
9	3.64	39	15.79	69	27.94	99	40.09
9½	3.85	39½	16.00	69½	28.15	99½	40.30
10	4.05	40	16.20	70	28.35	100	40.50
10½	4.25	40½	16.40	70½	28.55	100½	40.70
11	4.45	41	16.60	71	28.75	101	40.90
11½	4.66	41½	16.81	71½	28.96	101½	41.11
12	4.86	42	17.01	72	29.16	102	41.31
12½	5.06	42½	17.21	72½	29.36	102½	41.51
13	5.26	43	17.41	73	29.56	103	41.71
13½	5.47	43½	17.62	73½	29.77	103½	41.92
14	5.67	44	17.82	74	29.97	104	42.12
14½	5.87	44½	18.02	74½	30.17	104½	42.32
15	6.07	45	18.22	75	30.37	105	42.52
15½	6.28	45½	18.43	75½	30.58	105½	42.73
16	6.48	46	18.63	76	30.78	106	42.93
16½	6.68	46½	18.83	76½	30.98	106½	43.13
17	6.88	47	19.03	77	31.18	107	43.33
17½	7.09	47½	19.24	77½	31.39	107½	43.54
18	7.29	48	19.44	78	31.59	108	43.74
18½	7.49	48½	19.64	78½	31.79	108½	43.94
19	7.69	49	19.84	79	31.99	109	44.14
19½	7.90	49½	20.05	79½	32.20	109½	44.35
20	8.10	50	20.25	80	32.40	110	44.55
20½	8.30	50½	20.45	80½	32.60	110½	44.75
21	8.50	51	20.65	81	32.80	111	44.95
21½	8.71	51½	20.86	81½	33.01	111½	45.19
22	8.91	52	21.06	82	33.21	112	45.36
22½	9.11	52½	21.26	82½	33.41	112½	45.56
23	9.31	53	21.46	83	33.61	113	45.76
23½	9.52	53½	21.67	83½	33.82	113½	45.97
24	9.72	54	21.87	84	34.02	114	46.17
24½	9.92	54½	22.07	84½	34.22	114½	46.37
25	10.12	55	22.27	85	34.42	115	46.57
25½	10.33	55½	22.48	85½	34.63	115½	46.78
26	10.53	56	22.68	86	34.83	116	46.98
26½	10.73	56½	22.88	86½	35.03	116½	47.18
27	10.93	57	23.08	87	35.23	117	47.38
27½	11.14	57½	23.29	87½	35.44	117½	47.59
28	11.34	58	23.49	88	35.64	118	47.79
28½	11.54	58½	23.69	88½	35.84	118½	47.99
29	11.74	59	23.89	89	36.04	119	48.19
29½	11.95	59½	24.10	89½	36.25	119½	48.40
30	12.15	60	24.30	90	36.45	120	48.60

AT 41 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	12.50	60½	24.80	90½	37.10
		31	12.71	61	25.01	91	37.31
		31½	12.91	61½	25.21	91½	37.51
2	0.82	32	13.12	62	25.42	92	37.72
2½	1.02	32½	13.32	62½	25.62	92½	37.92
3	1.23	33	13.53	63	25.83	93	38.13
3½	1.43	33½	13.73	63½	26.03	93½	38.33
4	1.64	34	13.94	64	26.24	94	38.54
4½	1.84	34½	14.14	64½	26.44	94½	38.74
5	2.05	35	14.35	65	26.65	95	38.95
5½	2.25	35½	14.55	65½	26.85	95½	39.15
6	2.46	36	14.76	66	27.06	96	39.36
6½	2.66	36½	14.96	66½	27.26	96½	39.56
7	2.87	37	15.17	67	27.47	97	39.77
7½	3.07	37½	15.37	67½	27.67	97½	39.97
8	3.28	38	15.58	68	27.88	98	40.18
8½	3.48	38½	15.78	68½	28.08	98½	40.38
9	3.69	39	15.99	69	28.29	99	40.59
9½	3.89	39½	16.19	69½	28.49	99½	40.79
10	4.10	40	16.40	70	28.70	100	41.00
10½	4.30	40½	16.60	70½	28.90	100½	41.20
11	4.51	41	16.81	71	29.11	101	41.41
11½	4.71	41½	17.01	71½	29.31	101½	41.61
12	4.92	42	17.22	72	29.52	102	41.82
12½	5.12	42½	17.42	72½	29.72	102½	42.02
13	5.33	43	17.63	73	29.93	103	42.23
13½	5.53	43½	17.83	73½	30.13	103½	42.43
14	5.74	44	18.04	74	30.34	104	42.64
14½	5.94	44½	18.24	74½	30.54	104½	42.84
15	6.15	45	18.45	75	30.75	105	43.05
15½	6.35	45½	18.65	75½	30.95	105½	43.25
16	6.56	46	18.86	76	31.16	106	43.40
16½	6.76	46½	19.06	76½	31.36	106½	43.66
17	6.97	47	19.27	77	31.57	107	43.87
17½	7.17	47½	19.47	77½	31.77	107½	44.07
18	7.38	48	19.68	78	31.98	108	44.28
18½	7.58	48½	19.88	78½	32.18	108½	44.48
19	7.79	49	20.09	79	32.39	109	44.69
19½	7.99	49½	20.29	79½	32.59	109½	44.89
20	8.20	50	20.50	80	32.80	110	45.10
20½	8.40	50½	20.70	80½	33.00	110½	45.30
21	8.61	51	20.91	81	33.21	111	45.51
21½	8.81	51½	21.11	81½	33.41	111½	45.71
22	9.02	52	21.32	82	33.62	112	45.92
22½	9.22	52	21.52	82½	33.82	112½	46.12
23	9.43	53	21.73	83	34.03	113	46.33
23½	9.63	53½	21.93	83½	34.23	113½	46.53
24	9.84	54	22.14	84	34.44	114	46.74
24½	10.04	54½	22.34	84½	34.64	114½	46.94
25	10.25	55	22.55	85	34.85	115	47.15
25½	10.45	55½	22.75	85½	35.05	115½	47.35
26	10.66	56	22.96	86	35.26	116	47.56
26½	10.86	56½	23.16	86½	35.46	116½	47.76
27	11.07	57	23.37	87	35.67	117	47.97
27½	11.27	57½	23.57	87½	35.87	117½	48.17
28	11.48	58	23.78	88	36.08	118	48.38
28½	11.68	58½	23.98	88½	36.28	118½	48.58
29	11.89	59	24.19	89	36.49	119	48.79
29½	12.09	59½	24.39	89½	36.69	119½	48.99
30	12.30	60	24.60	90	36.90	120	49.20

AT 41½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	12.66	60½	25.11	90½	37.56
		31	12.86	61	25.31	91	37.76
		31½	13.07	61½	25.52	91½	37.97
2	0.83	32	13.28	62	25.73	92	38.18
2½	1.04	32½	13.49	62½	25.94	92½	38.39
3	1.24	33	13.69	63	26.14	93	38.59
3½	1.45	33½	13.90	63½	26.35	93½	38.80
4	1.66	34	14.11	64	26.56	94	39.01
4½	1.87	34½	14.32	64½	26.77	94½	39.22
5	2.07	35	14.52	65	26.97	95	39.42
5½	2.28	35½	14.73	65½	27.18	95½	39.63
6	2.49	36	14.94	66	27.39	96	39.84
6½	2.70	36½	15.15	66½	27.60	96½	40.05
7	2.90	37	15.35	67	27.80	97	40.25
7½	3.11	37½	15.56	67½	28.01	97½	40.46
8	3.32	38	15.77	68	28.22	98	40.67
8½	3.53	38½	15.98	68½	28.43	98½	40.88
9	3.73	39	16.18	69	28.63	99	41.08
9½	3.94	39½	16.39	69½	28.84	99½	41.29
10	4.15	40	16.60	70	29.05	100	41.50
10½	4.36	40½	16.81	70½	29.26	100½	41.71
11	4.56	41	17.01	71	29.46	101	41.91
11½	4.77	41½	17.22	71½	29.67	101½	42.12
12	4.98	42	17.43	72	29.88	102	42.33
12½	5.19	42½	17.64	72½	30.09	102½	42.54
13	5.39	43	17.84	73	30.29	103	42.74
13½	5.60	43½	18.05	73½	30.50	103½	42.95
14	5.81	44	18.26	74	30.71	104	43.16
14½	6.02	44½	18.47	74½	30.92	104½	43.37
15	6.22	45	18.67	75	31.12	105	43.57
15½	6.43	45½	18.88	75½	31.33	105½	43.78
16	6.64	46	19.09	76	31.54	106	43.99
16½	6.85	46½	19.30	76½	31.75	106½	44.20
17	7.05	47	19.50	77	31.95	107	44.40
17½	7.26	47½	19.71	77½	32.16	107½	44.61
18	7.47	48	19.92	78	32.37	108	44.82
18½	7.68	48½	20.13	78½	32.58	108½	45.03
19	7.88	49	20.33	79	32.78	109	45.23
19½	8.09	49½	20.54	79½	32.99	109½	45.44
20	8.30	50	20.75	80	33.20	110	45.65
20½	8.51	50½	20.96	80½	33.41	110½	45.86
21	8.71	51	21.16	81	33.61	111	46.06
21½	8.92	51½	21.37	81½	33.82	111½	46.27
22	9.13	52	21.58	82	34.03	112	46.48
22½	9.34	52½	21.79	82½	34.24	112½	46.69
23	9.54	53	21.99	83	34.44	113	46.89
23½	9.75	53½	22.20	83½	34.65	113½	47.10
24	9.96	54	22.41	84	34.86	114	47.31
24½	10.17	54½	22.62	84½	35.07	114½	47.52
25	10.37	55	22.82	85	35.27	115	47.72
25½	10.58	55½	23.03	85½	35.48	115½	47.93
26	10.79	56	23.24	86	35.69	116	48.14
26½	11.00	56½	23.45	86½	35.90	116½	48.35
27	11.20	57	23.65	87	36.10	117	48.55
27½	11.41	57½	23.86	87½	36.31	117½	48.76
28	11.62	58	24.07	88	36.52	118	48.97
28½	11.83	58½	24.28	88½	36.73	118½	49.18
29	12.03	59	24.48	89	36.93	119	49.38
29½	12.24	59½	24.69	89½	37.14	119½	49.59
30	12.45	60	24.90	90	37.35	120	49.80

AT 42 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	12.81	60½	25.41	90½	38.01
		31	13.02	61	25.62	91	38.22
		31½	13.23	61½	25.83	91½	38.43
2	0.84	32	13.44	62	26.04	92	38.64
2½	1.05	32½	13.65	62½	26.25	92½	38.85
3	1.26	33	13.86	63	26.46	93	39.06
3½	1.47	33½	14.07	63½	26.67	93½	39.27
4	1.68	34	14.28	64	26.88	94	39.48
4½	1.89	34½	14.49	64½	27.09	94½	39.69
5	2.10	35	14.70	65	27.30	95	39.90
5½	2.31	35½	14.91	65½	27.51	95½	40.11
6	2.52	36	15.12	66	27.72	96	40.32
6½	2.73	36½	15.33	66½	27.93	96½	40.53
7	2.94	37	15.54	67	28.14	97	40.74
7½	3.15	37½	15.75	67½	28.35	97½	40.95
8	3.36	38	15.96	68	28.56	98	41.16
8½	3.57	38½	16.17	68½	28.77	98½	41.37
9	3.78	39	16.38	69	28.98	99	41.58
9½	3.99	39½	16.59	69½	29.19	99½	41.79
10	4.20	40	16.80	70	29.40	100	42.00
10½	4.41	40½	17.01	70½	29.61	100½	42.21
11	4.62	41	17.22	71	29.82	101	42.42
11½	4.83	41½	17.43	71½	30.03	101½	42.63
12	5.04	42	17.64	72	30.24	102	42.84
12½	5.25	42½	17.85	72½	30.45	102½	43.05
13	5.46	43	18.06	73	30.66	103	43.26
13½	5.67	43½	18.27	73½	30.87	103½	43.47
14	5.88	44	18.48	74	31.08	104	43.68
14½	6.09	44½	18.69	74½	31.29	104½	43.89
15	6.30	45	18.90	75	31.50	105	44.10
15½	6.51	45½	19.11	75½	31.71	105½	44.31
16	6.72	46	19.32	76	31.92	106	44.52
16½	6.93	46½	19.53	76½	32.13	106½	44.73
17	7.14	47	19.74	77	32.34	107	44.94
17½	7.35	47½	19.95	77½	32.55	107½	45.15
18	7.56	48	20.16	78	32.76	108	45.36
18½	7.77	48½	20.37	78½	32.97	108½	45.57
19	7.98	49	20.58	79	33.18	109	45.78
19½	8.19	49½	20.79	79½	33.39	109½	45.99
20	8.40	50	21.00	80	33.60	110	46.20
20½	8.61	50½	21.21	80½	33.81	110½	46.41
21	8.82	51	21.42	81	34.02	111	46.62
21½	9.03	51½	21.63	81½	34.23	111½	46.83
22	9.24	52	21.84	82	34.44	112	47.04
22½	9.45	52½	22.05	82½	34.65	112½	47.25
23	9.66	53	22.26	83	34.86	113	47.46
23½	9.87	53½	22.47	83½	35.07	113½	47.67
24	10.08	54	22.68	84	35.28	114	47.88
24½	10.29	54½	22.89	84½	35.49	114½	48.09
25	10.50	55	23.10	85	35.70	115	48.30
25½	10.71	55½	23.31	85½	35.91	115½	48.51
26	10.92	56	23.52	86	36.12	116	48.72
26½	11.13	56½	23.73	86½	36.33	116½	48.93
27	11.34	57	23.94	87	36.54	117	49.14
27½	11.55	57½	24.15	87½	36.75	117½	49.35
28	11.76	58	24.36	88	36.96	118	49.56
28½	11.97	58½	24.57	88½	37.17	118½	49.77
29	12.18	59	24.78	89	37.38	119	49.98
29½	12.39	59½	24.99	89½	37.59	119½	50.19
30	12.60	60	25.20	90	37.80	120	50.40

AT 42½ CENTS PER HOUR.

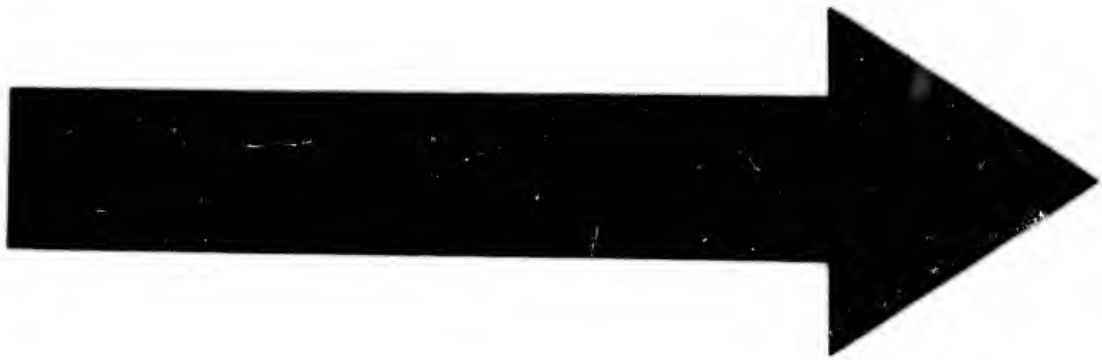
Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	12.96	60½	25.71	90½	38.46
		31	13.17	61	25.92	91	38.67
		31½	13.39	61½	26.14	91½	38.89
2	0.85	32	13.60	62	26.35	92	39.10
2½	1.06	32½	13.81	62½	26.56	92½	39.31
3	1.27	33	14.02	63	26.77	93	39.52
3½	1.49	33½	14.24	63½	26.99	93½	39.74
4	1.70	34	14.45	64	27.20	94	39.95
4½	1.91	34½	14.66	64½	27.41	94½	40.16
5	2.12	35	14.87	65	27.62	95	40.37
5½	2.34	35½	15.09	65½	27.84	95½	40.59
6	2.55	36	15.30	66	28.05	96	40.80
6½	2.76	36½	15.51	66½	28.26	96½	41.01
7	2.97	37	15.72	67	28.47	97	41.22
7½	3.19	37½	15.94	67½	28.69	97½	41.44
8	3.40	38	16.15	68	28.90	98	41.65
8½	3.61	38½	16.36	68½	29.11	98½	41.86
9	3.82	39	16.57	69	29.32	99	42.07
9½	4.04	39½	16.79	69½	29.54	99½	42.29
10	4.25	40	17.00	70	29.75	100	42.50
10½	4.46	40½	17.21	70½	29.96	100½	42.71
11	4.67	41	17.42	71	30.17	101	42.92
11½	4.89	41½	17.64	71½	30.39	101½	43.14
12	5.10	42	17.85	72	30.60	102	43.35
12½	5.31	42½	18.06	72½	30.81	102½	43.56
13	5.52	43	18.27	73	31.02	103	43.77
13½	5.74	43½	18.49	73½	31.24	103½	43.99
14	5.95	44	18.70	74	31.45	104	44.20
14½	6.16	44½	18.91	74½	31.66	104½	44.41
15	6.37	45	19.12	75	31.87	105	44.62
15½	6.59	45½	19.34	75½	32.09	105½	44.84
16	6.80	46	19.55	76	32.30	106	45.05
16½	7.01	46½	19.76	76½	32.51	106½	45.26
17	7.22	47	19.97	77	32.72	107	45.47
17½	7.44	47½	20.19	77½	32.94	107½	45.69
18	7.65	48	20.40	78	33.15	108	45.90
18½	7.86	48½	20.61	78½	33.36	108½	46.11
19	8.07	49	20.82	79	33.57	109	46.32
19½	8.29	49½	21.04	79½	33.79	109½	46.54
20	8.50	50	21.25	80	34.00	110	46.75
20½	8.71	50½	21.46	80½	34.21	110½	46.96
21	8.92	51	21.67	81	34.42	111	47.17
21½	9.14	51½	21.89	81½	34.64	111½	47.39
22	9.35	52	22.10	82	34.85	112	47.60
22½	9.56	52½	22.31	82½	35.06	112½	47.81
23	9.77	53	22.52	83	35.27	113	48.02
23½	9.99	53½	22.74	83½	35.49	113½	48.24
24	10.20	54	22.95	84	35.70	114	48.45
24½	10.41	54½	23.16	84½	35.91	114½	48.66
25	10.62	55	23.37	85	36.12	115	48.87
25½	10.84	55½	23.59	85½	36.34	115½	49.09
26	11.05	56	23.80	86	36.55	116	49.30
26½	11.26	56½	24.01	86½	36.76	116½	49.51
27	11.47	57	24.22	87	36.97	117	49.72
27½	11.69	57½	24.44	87½	37.19	117½	49.94
28	11.90	58	24.65	88	37.40	118	50.15
28½	12.11	58½	24.86	88½	37.61	118½	50.36
29	12.32	59	25.07	89	37.82	119	50.57
29½	12.54	59½	25.29	89½	38.04	119½	50.79
30	12.75	60	25 50	90	38.25	120	51.00

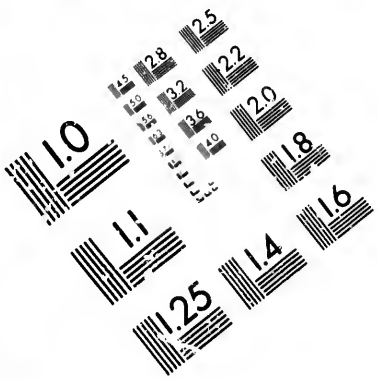
AT 43 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	13.11	60½	26.01	90½	38.91
		31	13.33	61	26.23	91	39.13
		31½	13.54	61½	26.44	91½	39.34
2	0.86	32	13.76	62	26.66	92	39.56
2½	1.07	32½	13.97	62½	26.87	92½	39.77
3	1.29	33	14.19	63	27.09	93	39.99
3½	1.50	33½	14.40	63½	27.30	93½	40.20
4	1.72	34	14.62	64	27.52	94	40.42
4½	1.93	34½	14.83	64½	27.73	94½	40.63
5	2.15	35	15.05	65	27.95	95	40.85
5½	2.36	35½	15.26	65½	28.16	95½	41.06
6	2.58	36	15.48	66	28.38	96	41.28
6½	2.79	36½	15.69	66½	28.59	96½	41.49
7	3.01	37	15.91	67	28.81	97	41.71
7½	3.22	37½	16.12	67½	29.02	97½	41.92
8	3.44	38	16.34	68	29.24	98	42.14
8½	3.65	38½	16.55	68½	29.45	98½	42.35
9	3.87	39	16.77	69	29.67	99	42.57
9½	4.08	39½	16.98	69½	29.88	99½	42.78
10	4.30	40	17.20	70	30.10	100	43.00
10½	4.51	40½	17.41	70½	30.31	100½	43.21
11	4.73	41	17.63	71	30.53	101	43.43
11½	4.94	41½	17.84	71½	30.74	101½	43.64
12	5.16	42	18.06	72	30.96	102	43.86
12½	5.37	42½	18.27	72½	31.17	102½	44.07
13	5.59	43	18.49	73	31.39	103	44.29
13½	5.80	43½	18.70	73½	31.60	103½	44.50
14	6.02	44	18.92	74	31.82	104	44.72
14½	6.23	44½	19.13	74½	32.03	104½	44.93
15	6.45	45	19.35	75	32.25	105	45.15
15½	6.66	45½	19.56	75½	32.46	105½	45.36
16	6.88	46	19.78	76	32.68	106	45.58
16½	7.09	46½	19.99	76½	32.89	106½	45.79
17	7.31	47	20.21	77	33.11	107	46.01
17½	7.52	47½	20.42	77½	33.32	107½	46.22
18	7.74	48	20.64	78	33.54	108	46.44
18½	7.95	48½	20.85	78½	33.75	108½	46.65
19	8.17	49	21.07	79	33.97	109	46.87
19½	8.38	49½	21.28	79½	34.18	109½	47.08
20	8.60	50	21.50	80	34.40	110	47.30
20½	8.81	50½	21.71	80½	34.61	110½	47.51
21	9.03	51	21.93	81	34 83	111	47.73
21½	9.24	51½	22.14	81½	35.04	111½	47.94
22	9.46	52	22.36	82	35.26	112	48.16
22½	9.67	52½	22.57	82½	35.47	112½	48.37
23	9.89	53	22.79	83	35.09	113	48.59
23½	10.10	53½	23.00	83½	35.90	113½	48.80
24	10.32	54	23.22	84	36.12	114	49.02
24½	10.53	54½	23.43	84½	36.33	114½	49.23
25	10.75	55	23.65	85	36.55	115	49.45
25½	10.96	55½	23.86	85½	36.76	115½	49.66
26	11.18	56	24.08	86	36.98	116	49.88
26½	11.39	56½	24.29	86½	37.19	116½	50.09
27	11.61	57	24.51	87	37.41	117	50.31
27½	11.82	57½	24.72	87½	37.62	117½	50.52
28	12.04	58	24.94	88	37.84	118	50.74
28½	12.25	58½	25.15	88½	38.05	118½	50.95
29	12.47	59	25.37	89	38.27	119	51.17
29½	12.68	59½	25.58	89½	38.48	119½	51.38
30	12.90	60	25.80	90	38.70	120	51.60

AT 43½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	13.27	60½	26.32	90½	39.37
		31	13.48	61	26.53	91	39.58
		31½	13.70	61½	26.75	91½	39.80
2	0.87	32	13.92	62	26.97	92	40.02
2½	1.09	32½	14.14	62½	27.19	92½	40.24
3	1.30	33	14.35	63	27.40	93	40.45
3½	1.52	33½	14.57	63½	27.62	93½	40.67
4	1.74	34	14.79	64	27.84	94	40.89
4½	1.96	34½	15.01	64½	28.06	94½	41.11
5	2.17	35	15.22	65	28.27	95	41.32
5½	2.39	35½	15.44	65½	28.49	95½	41.54
6	2.61	36	15.66	66	28.71	96	41.76
6½	2.83	36½	15.88	66½	28.93	96½	41.98
7	3.04	37	16.09	67	29.14	97	42.19
7½	3.26	37½	16.31	67½	29.36	97½	42.41
8	3.48	38	16.53	68	29.58	98	42.63
8½	3.70	38½	16.75	68½	29.80	98½	42.85
9	3.91	39	16.96	69	30.01	99	43.06
9½	4.13	39½	17.18	69½	30.23	99½	43.28
10	4.35	40	17.40	70	30.45	100	43.50
10½	4.57	40½	17.62	70½	30.67	100½	43.72
11	4.78	41	17.83	71	30.88	101	43.93
11½	5.00	41½	18.05	71½	31.10	101½	44.15
12	5.22	42	18.27	72	31.32	102	44.37
12½	5.44	42½	18.49	72½	31.54	102½	44.59
13	5.65	43	18.70	73	31.75	103	44.80
13½	5.87	43½	18.92	73½	31.97	103½	45.02
14	6.09	44	19.14	74	32.19	104	45.24
14½	6.31	44½	19.36	74½	32.41	104½	45.46
15	6.52	45	19.57	75	32.62	105	45.67
15½	6.74	45½	19.79	75½	32.84	105½	45.89
16	6.96	46	20.01	76	33.06	106	46.11
16½	7.18	46½	20.23	76½	33.28	106½	46.33
17	7.39	47	20.44	77	33.49	107	46.54
17½	7.61	47½	20.66	77½	33.71	107½	46.76
18	7.83	48	20.88	78	33.93	108	46.98
18½	8.05	48½	21.10	78½	34.15	108½	47.20
19	8.26	49	21.31	79	34.36	109	47.41
19½	8.48	49½	21.53	79½	34.58	109½	47.63
20	8.70	50	21.75	80	34.80	110	47.85
20½	8.92	50½	21.97	80½	35.02	110½	48.07
21	9.13	51	22.18	81	35.23	111	48.28
21½	9.35	51½	22.40	81½	35.45	111½	48.50
22	9.57	52	22.62	82	35.67	112	48.72
22½	9.79	52½	22.84	82½	35.89	112½	48.94
23	10.00	53	23.05	83	36.10	113	49.15
23½	10.22	53½	23.27	83½	36.32	113½	49.37
24	10.44	54	23.49	84	36.54	114	49.59
24½	10.66	54½	23.71	84½	36.76	114½	49.81
25	10.87	55	23 92	85	36.97	115	50.02
25½	11.09	55½	24.14	85½	37.19	115½	50.24
26	11.31	56	24.36	86	37.41	116	50.46
26½	11.53	56½	24.58	86½	37.63	116½	50.68
27	11.74	57	24.79	87	37.84	117	50.89
27½	11.96	57½	25.01	87½	38.06	117½	51.11
28	12.18	58	25.23	88	38.28	118	51.33
28½	12.40	58½	25.45	88½	38.50	118½	51.55
29	12.61	59	25 66	89	38.71	119	51.76
29½	12.83	59½	25.88	89½	38.93	119½	51.98
30	13.05	60	26.10	90	39.15	120	52.20





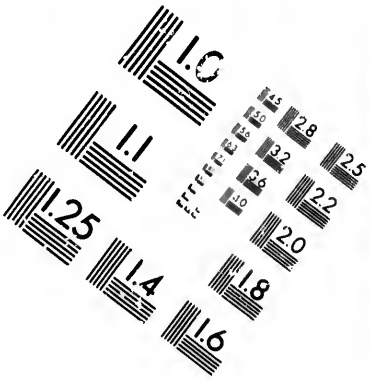
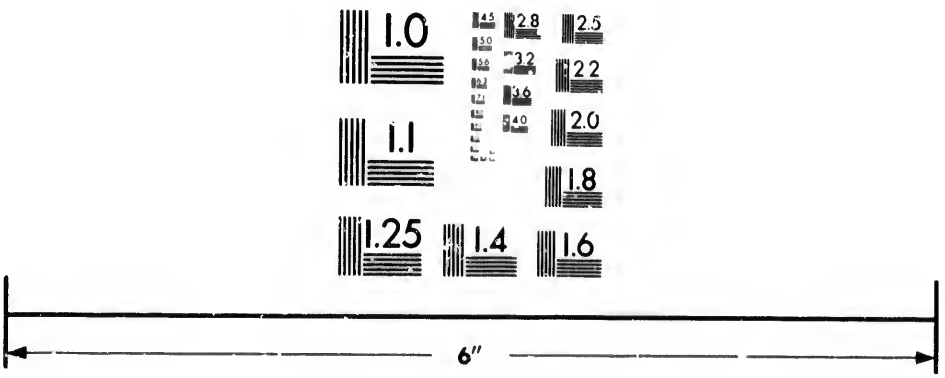
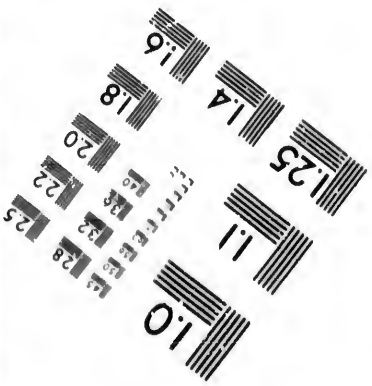
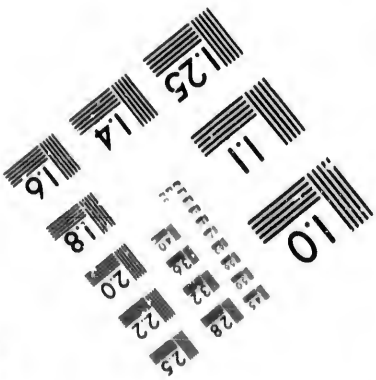


IMAGE EVALUATION TEST TARGET (MT-3)







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23 WEST MAIN STREET
WEBSTER, N.Y. 14580
(716) 872-4503

2.8
3.2
2.5
2.2
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1.0

AT 44 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	13.42	60½	26.62	90½	39.82
		31	13.64	61	26.84	91	40.04
		31½	13.86	61½	27.06	91½	40.26
2	0.88	32	14.08	62	27.28	92	40.48
2½	1.10	32½	14.30	62½	27.50	92½	40.70
3	1.32	33	14.52	63	27.72	93	40.92
3½	1.54	33½	14.74	63½	27.94	93½	41.14
4	1.76	34	14.96	64	28.16	94	41.36
4½	1.98	34½	15.18	64½	28.38	94½	41.58
5	2.20	35	15.40	65	28.60	95	41.80
5½	2.42	35½	15.62	65½	28.82	95½	42.02
6	2.64	36	15.84	66	29.04	96	42.24
6½	2.86	36½	16.06	66½	29.26	96½	42.46
7	3.08	37	16.28	67	29.48	97	42.68
7½	3.30	37½	16.50	67½	29.70	97½	42.90
8	3.52	38	16.72	68	29.92	98	43.12
8½	3.74	38½	16.94	68½	30.14	98½	43.34
9	3.96	39	17.16	69	30.36	99	43.56
9½	4.18	39½	17.38	69½	30.58	99½	43.78
10	4.40	40	17.60	70	30.80	100	44.00
10½	4.62	40½	17.82	70½	31.02	100½	44.22
11	4.84	41	18.04	71	31.24	101	44.44
11½	5.06	41½	18.26	71½	31.46	101½	44.66
12	5.28	42	18.48	72	31.68	102	44.88
12½	5.50	42½	18.70	72½	31.90	102½	45.10
13	5.72	43	18.92	73	32.12	103	45.32
13½	5.94	43½	19.14	73½	32.34	103½	45.54
14	6.16	44	19.36	74	32.56	104	45.76
14½	6.38	44½	19.58	74½	32.78	104½	45.98
15	6.60	45	19.80	75	33.00	105	46.20
15½	6.82	45½	20.02	75½	33.22	105½	46.42
16	7.04	46	20.24	76	33.44	106	46.64
16½	7.26	46½	20.46	76½	33.66	106½	46.86
17	7.48	47	20.68	77	33.88	107	47.08
17½	7.70	47½	20.90	77½	34.10	107½	47.30
18	7.92	48	21.12	78	34.32	108	47.52
18½	8.14	48½	21.34	78½	34.54	108½	47.74
19	8.36	49	21.56	79	34.76	109	47.96
19½	8.58	49½	21.78	79½	34.98	109½	48.18
20	8.80	50	22.00	80	35.20	110	48.40
20½	9.02	50½	22.22	80½	35.42	110½	48.62
21	9.24	51	22.44	81	35.64	111	48.84
21½	9.46	51½	22.66	81½	35.86	111½	49.06
22	9.68	52	22.88	82	36.08	112	49.28
22½	9.90	52½	23.10	82½	36.30	112½	49.50
23	10.12	53	23.32	83	36.52	113	49.72
23½	10.34	53½	23.54	83½	36.74	113½	49.94
24	10.56	54	23.76	84	36.96	114	50.16
24½	10.78	54½	23.98	84½	37.18	114½	50.38
25	11.00	55	24.20	85	37.40	115	50.60
25½	11.22	55½	24.42	85½	37.62	115½	50.82
26	11.44	56	24.64	86	37.84	116	51.04
26½	11.66	56½	24.86	86½	38.06	116½	51.26
27	11.88	57	25.08	87	38.28	117	51.48
27½	12.10	57½	25.30	87½	38.50	117½	51.70
28	12.32	58	25.52	88	38.72	118	51.92
28½	12.54	58½	25.74	88½	38.94	118½	52.14
29	12.76	59	25.96	89	39.16	119	52.36
29½	12.98	59½	26.18	89½	39.38	119½	52.58
30	13.20	60	26.40	90	39.60	120	52.80

AT 44½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	13.57	60½	26.92	90½	40.27
		31	13.79	61	27.14	91	40.49
		31½	14.02	61½	27.37	91½	40.72
2	0.89	32	14.24	62	27.59	92	40.94
2½	1.11	32½	14.46	62½	27.81	92½	41.16
3	1.33	33	14.68	63	28.03	93	41.38
3½	1.56	33½	14.91	63½	28.26	93½	41.61
4	1.78	34	15.13	64	28.48	94	41.83
4½	2.00	34½	15.35	64½	28.70	94½	42.05
5	2.22	35	15.57	65	28.92	95	42.27
5½	2.45	35½	15.80	65½	29.15	95½	42.50
6	2.67	36	16.02	66	29.37	96	42.72
6½	2.89	36½	16.24	66½	29.59	96½	42.94
7	3.11	37	16.46	67	29.81	97	43.16
7½	3.34	37½	16.69	67½	30.04	97½	43.39
8	3.56	38	16.91	68	30.26	98	43.61
8½	3.78	38½	17.13	68½	30.48	98½	43.83
9	4.00	39	17.35	69	30.70	99	44.05
9½	4.23	39½	17.58	69½	30.93	99½	44.28
10	4.45	40	17.80	70	31.15	100	44.50
10½	4.67	40½	18.02	70½	31.37	100½	44.72
11	4.89	41	18.24	71	31.59	101	44.94
11½	5.12	41½	18.47	71½	31.82	101½	45.17
12	5.34	42	18.69	72	32.04	102	45.39
12½	5.56	42½	18.91	72½	32.26	102½	45.61
13	5.78	43	19.13	73	32.48	103	45.83
13½	6.01	43½	19.36	73½	32.71	103½	46.06
14	6.23	44	19.58	74	32.93	104	46.28
14½	6.45	44½	19.80	74½	33.15	104½	46.50
15	6.67	45	20.02	75	33.37	105	46.72
15½	6.90	45½	20.25	75½	33.60	105½	46.95
16	7.12	46	20.47	76	33.82	106	47.17
16½	7.34	46½	20.69	76½	34.04	106½	47.39
17	7.56	47	20.91	77	34.26	107	47.61
17½	7.79	47½	21.14	77½	34.49	107½	47.84
18	8.01	48	21.36	78	34.71	108	48.06
18½	8.23	48½	21.58	78½	34.93	108½	48.28
19	8.45	49	21.80	79	35.15	109	48.50
19½	8.68	49½	22.03	79½	35.38	109½	48.73
20	8.90	50	22.25	80	35.60	110	48.95
20½	9.12	50½	22.47	80½	35.82	110½	49.17
21	9.34	51	22.69	81	36.04	111	49.39
21½	9.57	51½	22.92	81½	36.27	111½	49.62
22	9.79	52	23.14	82	36.49	112	49.84
22½	10.01	52½	23.36	82½	36.71	112½	50.06
23	10.23	53	23.58	83	36.93	113	50.28
23½	10.46	53½	23.81	83½	37.16	113½	50.51
24	10.68	54	24.03	84	37.38	114	50.73
24½	10.90	54½	24.25	84½	37.60	114½	50.95
25	11.12	55	24.47	85	37.82	115	51.17
25½	11.35	55½	24.70	85½	38.05	115½	51.40
26	11.57	56	24.92	86	38.27	116	51.62
26½	11.79	56½	25.14	86½	38.49	116½	51.84
27	12.01	57	25.36	87	38.71	117	52.06
27½	12.24	57½	25.59	87½	38.94	117½	52.29
28	12.46	58	25.81	88	39.16	118	52.51
28½	12.68	58½	26.03	88½	39.38	118½	52.73
29	12.90	59	26.25	89	39.60	119	52.95
29½	13.13	59½	26.48	89½	39.83	119½	53.18
30	13.35	60	26.70	90	40.05	120	53.40

AT 45 CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.
		30½	13.72	60½	27.22	90½	40.72
		31	13.95	61	27.45	91	40.95
		31½	14.17	61½	27.67	91½	41.17
2	0.90	32	14.40	62	27.90	92	41.40
2½	1.12	32½	14.62	62½	28.12	92½	41.62
3	1.35	33	14.85	63	28.35	93	41.85
3½	1.57	33½	15.07	63½	28.57	93½	42.07
4	1.80	34	15.30	64	28.80	94	42.30
4½	2.02	34½	15.52	64½	29.02	94½	42.52
5	2.25	35	15.75	65	29.25	95	42.75
5½	2.47	35½	15 97	65½	29.47	95½	42.97
6	2.70	36	16.20	66	29.70	96	43.20
6½	2.92	36½	16.42	66½	29.92	96½	43.42
7	3.15	37	16.65	67	30.15	97	43.65
7½	3.37	37½	16.87	67½	30.37	97½	43.87
8	3.60	38	17.10	68	30.60	98	44.10
8½	3.82	38½	17.32	68½	30.82	98½	44.32
9	4.05	39	17.55	69	31.05	99	44.55
9½	4.27	39½	17.77	69½	31.27	99½	44.77
10	4.50	40	18.00	70	31.50	100	45.00
10½	4.72	40½	18.22	70½	31.72	100½	45.22
11	4.05	41	18.45	71	31.95	101	15.45
11½	5.17	41½	18.67	71½	32.17	101½	45.67
12	5.40	42	18.00	72	32.40	102	45.90
12½	5.62	42½	19.12	72½	32.62	102½	46.12
13	5.85	43	19.35	73	32.85	103	46.35
13½	6.07	43½	19.57	73½	33.07	103½	46.57
14	6.30	44	19.80	74	33.30	104	46.80
14½	6.52	44½	20.02	74½	33.52	104½	47.02
15	6.75	45	20.25	75	33.75	105	47.25
15½	6.97	45½	20.47	75½	33.97	105½	47.47
16	7.20	46	20.70	76	34.20	106	47.70
16½	7.42	46½	20.92	76½	34.42	106½	47.92
17	7.65	47	21.15	77	34.65	107	48.15
17½	7.87	47½	21.37	77½	34.87	107½	48.37
18	8.10	48	21.60	78	35.10	108	48.60
18½	8.32	48½	21.82	78½	35.32	108½	48.82
19	8.55	49	22.05	79	35.55	109	49.05
19½	8.77	49½	22.27	79½	35.77	109½	49.27
20	9.00	50	22.50	80	36.00	110	49.50
20½	9.22	50½	22.72	80½	36.22	110½	49.72
21	9.45	51	22.95	81	36.45	111	49.95
21½	9.67	51½	23.17	81½	36.67	111½	50.17
22	9.90	52	23.40	82	36.90	112	50.40
22½	10.12	52½	23.62	82½	37.12	112½	50.62
23	10.35	53	23.85	83	37.35	113	50.85
23½	10.57	53½	24.07	83½	37.57	113½	51.07
24	10.80	54	24.30	84	37.80	114	51.30
24½	11.02	54½	24.52	84½	38.02	114½	51.52
25	11.25	55	24.75	85	38.25	115	51.75
25½	11.47	55½	24.97	85½	38.47	115½	51.97
26	11.70	56	25.20	86	38.70	116	52.20
26½	11.92	56½	25.42	86½	38.92	116½	52.42
27	12.15	57	25.65	87	39.15	117	52.65
27½	12.37	57½	25.87	87½	39.37	117½	52.87
28	12.60	58	26.10	88	39.60	118	53.10
28½	12.82	58½	26.32	88½	39.82	118½	53.32
29	13.05	59	26.55	89	40.05	119	53.55
29½	13.27	59½	26.77	89½	40.27	119½	53.77
30	13.50	60	27.00	90	40.50	120	54.00

AT 45½ CENTS PER HOUR.

Hrs.	Am't.	Hrs.	Am't.	Hrs.	Am't.	Hrs	Am't.
		30½	13.88	60½	27.53	90½	41.18
		31	14.10	61	27.75	91	41.40
		31½	14 33	61½	27.98	91½	41.63
2	0.91	32	14.56	62	28.21	92	41.86
2½	1.14	32½	14.79	62½	28.44	92½	42.09
3	1.36	33	15.01	63	28.66	93	42.31
3½	1.59	33½	15.24	63½	28.89	93½	42.54
4	1.82	34	15.47	64	29.12	94	42.77
4½	2.05	34½	15.70	64½	29.35	94½	43.00
5	2.27	35	15.92	65	29.57	95	43.22
5½	2.50	35½	16.15	65½	29.80	95½	43.45
6	2.73	36	16.38	66	30.03	96	43.68
6½	2.96	36½	16.61	66½	30.26	96½	43.91
7	3.18	37	16.83	67	30.48	97	44.13
7½	3.41	37½	17.06	67½	30.71	97½	44.36
8	3.64	38	17.29	68	30.94	98	44.59
8½	3.87	38½	17.52	68½	31.17	98½	44.82
9	4.09	39	17.74	69	31.39	99	45.04
9½	4.32	39½	17.97	69½	31.62	99½	45.27
10	4.55	40	18.20	70	31.85	100	45.50
10½	4.78	40½	18.43	70½	32.08	100½	45.73
11	5.00	41	18.65	71	32.30	101	45.95
11½	5.23	41½	18.88	71½	32.53	101½	46.18
12	5.46	42	19.11	72	32.76	102	46.41
12½	5.69	42½	19.34	72½	32.99	102½	46.64
13	5.91	43	19.56	73	33.21	103	46.86
13½	6.14	43½	19.79	73½	33.44	103½	47.09
14	6.37	44	20.02	74	33.67	104	47.32
14½	6.60	44½	20.25	74½	33.90	104½	47.55
15	6.82	45	20.47	75	34.12	105	47.77
15½	7.05	45½	20.70	75½	34.35	105½	48.00
16	7.28	46	20.93	76	34.58	106	48.23
16½	7.51	46½	21.16	76½	34.81	106½	48.46
17	7.73	47	21.38	77	35.03	107	48.68
17½	7.96	47½	21.61	77½	35.26	107½	48.91
18	8.19	48	21.84	78	35.49	108	49.14
18½	8.42	48½	22.07	78½	35.72	108½	49.37
19	8.64	49	22.29	79	35.94	109	49.59
19½	8.87	49½	22.52	79½	36.17	109½	49.82
20	9.10	50	22.75	80	36.40	110	50.05
20½	9.33	50½	22.98	80½	36.63	110½	50.28
21	9.55	51	23.20	81	36.85	111	50.50
21½	9.78	51½	23.43	81½	37.08	111½	50.73
22	10.01	52	23.66	82	37.31	112	50.96
22½	10.24	52½	23.89	82½	37.54	112½	51.19
23	10.46	53	24.11	83	37.76	113	51.41
23½	10.69	53½	24.34	83½	37.99	113½	51.64
24	10.92	54	24.57	84	38.22	114	51.87
24½	11.15	54½	24.80	84½	38.45	114½	52.10
25	11.37	55	25.02	85	38.67	115	52.32
25½	11.60	55½	25.25	85½	38.90	115½	52.55
26	11.83	56	25.48	86	39.13	116	52.78
26½	12.06	56½	25.71	86½	39.36	116½	53.01
27	12.28	57	25.93	87	39.58	117	53.23
27½	12.51	57½	26.16	87½	39.81	117½	53.46
28	12.74	58	26.39	88	40.04	118	53.69
28½	12.97	58½	26.62	88½	40.27	118½	53.92
29	13.19	59	26.84	89	40.49	119	54.14
29½	13.42	59½	27.07	89½	40.72	119½	54.37
30	13.65	60	27.30	90	40.95	120	54.60

Practical Hints for Builders.

Building Sites.—In selecting the site for a dwelling, the preference should be given to one in which the subsoil is naturally dry and the ground elevated, so as to afford facility for getting rid of the seweage and surface water. The best soil is supposed to be gravel or sand. Chalk and other open strata are also good, but clay, particularly if of a retrentive nature, appears less likely to form a healthy site. The rain water is often retained for a long time on the surface of clayey soil, and with some kinds of clay it is absorbed, making the ground cold and damp, causing fogs, which hang over it longer than usual. The sites to be particularly avoided are those in the neighborhood of swamps, or other ground recently reclaimed from rivers, estuaries, or harbours, in which deposits have been formed from mud containing organic matter such as that produced when sewage is allowed to flow into the stream. Slight eminences on the borders of swamps are also frequently unhealthy, according to their position with respect to the prevailing winds. Among hills the unheathly spots are enclosed valleys, any spot where the air must stagnate, ravines, or places at their head or entrance. In well-drained towns the nature of the subsoil is not of so much importance as in the country, owing to the buildings, roads, and pavements preventing the rain water from finding its way below the surface, and from the provision usually made for taking it away rapidly into the streams and water courses. To render a site healthy, the level of the subsoil water should be 8 or 10 feet below the surface, and where this does not occur naturally, drains should be formed to keep it below this depth. The raising of subsoil in malarious districts has been known to cause an outbreak of ague, and the lowering of it by draining has, on the contrary, caused an improvement in the health of the inhabitants. All soils except when saturated with water, contain a large quantity of air, and the more porous the soil the more readily does the air pass through it. In the case of towns and habitations generally this fact has an important bearing on health, as this air may be drawn into the houses through the ground under the basement, and dangerous consequences ensure if the soil in the neighborhood is saturated with organic matter, which frequently happens when animal excreta has been deposited on the surface or has escaped from sewers and other receptacles. Ground air is invariably damp and where it is permitted to stagnate as in the basements of houses, the growth of fungi is encouraged and the woodwork of the house is destroyed by dry rot ; an unwholesome smell pervades the whole house, and the health of the occupants suffers. In all cases, even those in which the natural subsoil has not been disturbed, and, whatever may be its nature, the ground under the basement of a dwelling should be rendered impervious to air and moisture. To effect this, nothing appears to answer so well as a layer of good concrete about 6 inches thick—probably the best is that made with well dried gravel and coal tar. Portland cement, both in the concrete and as a rendering over the surface, also answers, but no lime should be used which is not capable of resisting the effects of moisture. Stone slabs or flagging 2 or 3 inches thick, if well bedded and jointed with good mortar or cement, and asphalte not less than ½ inch thick, if laid on concrete, may also be used, but they are expensive. Before the adoption of any of these coverings, it is of

course presumed that the level of the subsoil water is sufficiently below the floor of the basement. Where the subsoil is naturally moist the damp should be prevented from rising through the walls by the interposition of a proper damp course which may be of roofing slates in two thicknesses bedded in Portland cement, or of glazed earthenware such as that sold for the purpose, but the best appears to be a layer of asphalte about ½ inch thick through the thickness of the foundation walls. The ground floor of houses where there is no basement should be raised about two feet above the soil, and the space below well ventilated. Where there is a choice, dwellings should be so placed that as many of the rooms as possible may receive the sun's rays during some portion of the day. It is said that a south-eastern aspect is the best for the front of a house; it receives the morning sun. The north and east are usually undesirable aspects to select, owing to the cold winds which usually blow from those points. The selection of an aspect, will, however, mainly depend on the climate, and the direction of the prevailing winds. The prospect from the windows of sitting rooms should be cheerful, whether the house be situated in the town or country, as a pleasantprospect assists considerably towards inducing a cheerful state of mind—a matter of no small importance to health.

LAYING FOUNDATIONS.—The foundation of a building, says Sir J. Gowans, is of primary importance, as, unless it is secure, the permanency of the structure cannot be maintained, however well built it may be. Before laying a stone the builder should be satisfied that the strata will give equal resistance to the pressure that may be put upon it. Strata that are hard and soft are very dangerous. Even clay if mixed with bowlders (which often happens) cannot be depended upon, unless they are removed, and means taken to equalize the ground on which the buildings are to be erected. Next to rock, no better foundation can be got than sand or gravel when dry. If wet, means should be taken to drain away the water; but, if this cannot be done, large flat bedded stones of sufficient area, fairly dressed in beds and joints and well put together, will, as the load increases, secure a foundation that anything can be built upon. In my own experience I have often tested this, and particularly when building a bridge on a railway contract I had many years ago. This was an under bridge of considerable span, the girders being in the form of an arch, in segments of cast iron, the security of which depended greatly on the permanent resistance of the abutments, or the bolts which held these segments together at their joints. In digging for a foundation it was found that the strata were very soft, being layers of sand and moss alternately, and to prevent failure I took the precaution to strengthen the foundation of the first abutment by driving piles to a depth of 30 to 40 feet, with horizontal planking, on which the foundation stones were bedded. Before building the second abutment, acting on the advice of a railway contractor who had had more experience than myself, I adopted a different plan—viz., to dig out the soft material to a depth and area as secured an outward resistance to meet the pressure of the large sized stones that were afterwards put into the foundation, course after course, until the load pressed out the water, and so secured a foundation which was equally as strong, if not stronger, than the first. Where the stratum is unequal or not to be depended upon, I know of nothing better than a good bed of concrete not less than 3 ft thick, and no contractor should neglect this where there is the slightest doubt as to the sustaining character of the ground. This is always necessary in erections of different heights, and is particularly required in churches and other buildings where the spire, tower or other elevation bears more heavily on the foundation than the walls which abut

upon them. And, in addition to this, and to make sure, I would have extra courses in the foundation of the higher and heavier portions, as in the hurry with which we build now-a-days every precaution is necessary. The same care should be taken with respect to the oriel windows or projections which do not go to the full heighth of the building, and consequently have not the same pressure on the foundation. The walls to which these lighter projections are attached should not only be well founded, but the tie or bond which unites the one wall to the other should be left free on the upper beds, so as to allow for the subsidence of the heavier wall without causing the fractures so often seen where this precaution is not taken.

THE STRENGTH OF A WALL.—The strength of a wall depends, of course, largely on the material used. A good, hard burned brick, well laid in cement mortar, makes a very strong wall. To tell a good brick, first examine the color; if it is very light, an orange red, the brick is apt to be soft. If the brick is easily carved with a knife, it is soft. If it can be crushed to a powder easily, it is soft. If two bricks are struck together sharply and the sound is dull, the bricks are poor; if the sound is clear, ringing, metallic, the bricks are good and hard. If brick shows a neat fracture, it is a good sign; a ragged fracture is generally a poor sign. The fracture also shows the evenness of the burning and fineness of the material. A brick that chips and cannot be cut easily is a good brick. The darker the brick, the harder burned. This of course, does not hold good for artificially-colored bricks. The straight and more regular the brick, the softer it is (as a rule), as hard burning is apt to warp a brick. What has been said of the strength of brick holds good of terra cotta. The latter should be designed to be of same thickness, if possible, in all parts, and any hollows caused thereby must be filled in solid. It is best to fill in the hollows with bricks and mortar several days in advance, and let the filling set, so as to be sure it will not swell up afterwards and burst the terra-cotta.

CAPACITY OF CYLINDRICAL CISTERNS.—The following table shows the capacity in gallons for each foot in depth of cylindrical cisterns of any diameter:

Diameter.	Gallons.	Diameter.	Gallons
25 ft.	3,059	7 ft.	239
20 ft.	1,958	6½ ft.	206
15 ft.	1,101	6 ft.	176
14 ft.	959	5 ft.	122
13 ft.	827	4½ ft.	99
12 ft.	705	4 ft.	78
11 ft.	592	3 ft.	44
10 ft.	489	2½ ft.	30
9 ft.	396	2 ft.	19
8 ft.	313		

POWER OF WALLS TO RESIST PRESSURE.—Walls laid up of good, hard-burned bricks, in mortar composed of good lime and sharp sand, will resist a pressure of 1,500 pounds per square inch, or 216,000 pounds per square foot, at which figure it would require 1,600 feet height of twelve-inch wall to crush the bottom courses, allowing 135 pounds as the weight of each cubic foot. It also appears from accurate calculations and measurements that walls laid up in the same quality of brick and mortar, with one-third quantity of Portland cement added to the same, are capable of resisting some 2,500 pounds per square inch, or 360,000 pounds per square foot; this would require a height of wall 2,700 feet to crush the bottom bricks.

TO PREVENT MOISTURE FROM PENETRATING WALLS.—Sylvester's process for excluding moisture from external walls consists in using two washes or solutions for covering the surface of brick walls, one composed of soap and water and one of alum and water. The proportions are three-quarters of a pound of soap to one gallon of water and half a pound of alum to four gallons of water. Both substances must be perfectly dissolved in water before using. The walls should be perfectly clean and dry and the temperature of the air should not be below 50° Fahrenheit when the compositions are applied. The first, or soap wash, should be laid on when at boiling heat with a flat brush, taking care not to form a froth on the brick work. This wash should remain twenty-four hours, so as to become dry and hard before the second, or alum wash, is applied, which should be done in the same manner as the first.

The temperature of this wash when applied may be 60° or 70°, and it should also remain twenty-four hours before a second coat of the soap wash is put on, and these coats are to be repeated alternately until the walls are made impervious to water. The alum and soap thus combined form an insoluble compound, filling the pores of the masonry and entirely preventing the water from penetrating the walls. Four coatings will render bricks impenetrable.

HOW TO MAKE GOOD BLUE PRINTS.—The prime requisite for making good blue prints is a good tracing. The best material is tracing cloth. If tracing paper is used it should have a bluish but never a yellowish tint, neither should the paper be too thick, as otherwise light will slant through the tracing under the lines. The tracing should have no creases or wrinkles. All lines of the tracing, down to the very finest, should be absolutely black. This is imperative. When ink does not give sufficiently opaque lines, it can be improved by adding burnt sienna, burnt umber or gamboge; this detracts from its quality as a black drawing ink, but makes it better for tracings to be printed. To properly expose prints it is necessary to use a print frame, with strong springs, and an even, thick elastic cushion. To wash prints it is necessary to have water or developer, in a vessel (bath tray) as large as the tracing, and the bath should always be slightly tepid or at least not cold. The prepared paper should be kept and handled only in dim light, and be carefully protected from dampness. To print, the glass in the frame should be kept clean and free from dust. After removing the back of the frame and the cushion, place the tracing on the glass, with the inked side against the glass (or it will give a negative print,) place on that the prepared paper, the prepared side toward the tracing, and see that all lies smooth and is free from creases or wrinkles. Then put the felt cushion on smoothly, and close and lock the frame. Lack of contact produces blurred prints. Examine tracing and paper through the glass in the frame, and if there is lack of contact anywhere correct it by placing paper or pasteboard between cushion and back of frame. When looking at the print to determine time of exposure, open only part of the frame, and raise a corner of the paper. In carrying the print to the bath after exposure, roll it with the blank side out, to protect it from light, and be quick about it.

Experts in house building have suggested that grates in second stories are usually less safe than those below, as the narrower joists give little room for the boxing of the hearth. It is also urged that grates be examined carefully to determine whether the back of the flue is simply of four inch wall, which is always dangerous at the back of a grate in a frame house. This can be determined by measuring the distance the breasts extend out from the wall, and as sometimes the breast runs through flush with the face of the wall in the next room, the calculation is to be made accordingly.

TO REMOVE EXUDATIONS FROM BRICK WALLS—The simplest and least expensive method for removing salt-peter exudation from brick work, when the offlorescence is in position where the sun and wind do not have free access, is to wash it off with diluted hydrochloric or common muriatic acid of commerce. About half a pound of the acid is used with an ordinary pailful of water, the application being made with a sponge.

Wood soaked for five days in a 7 per cent. solution of phosphate of soda, and after drying suspended for seven days in a 13 per cent. solution of chloride of barium stands the severest test—twelve months in moist earth near a manure pit—without sign of decay or mold.

TO PRESERVE PENCIL DRAWINGS.—Pencil drawings may be rendered ineffaceable by a very simple process. Slightly warm a sheet of ordinary drawing paper, then place it carefully on the surface of a solution of white resin in alcohol, leaving it there long enough to become thoroughly moistened. Afterwards dry in a current of warm air. Paper prepared in this way has a very smooth surface. In order to fix the drawing, the paper is simply to be warmed for a few moments. This process may prove useful for the preservation of plans or designs when want of time or any other cause will not allow of draughtsmen reproducing them in ink. A simpler plan than this is to brush over the back of the paper containing the pencil sketch with a weak solution of shellac in alcohol. Chalk and pencil drawings may be fixed (though not so thoroughly as by the above methods) by washing them with skimmed milk, or with water holding in solution a little isinglass or gum. When the first is used great care must be taken to deprive it of the whole of the cream, as the latter substance would cause the drawing to look streaky. An easy way of applying these fluids is to pour them into a shallow vessel, and to lay the drawings flat upon the surface of the liquid; after which it should be gently removed and placed on white blotting paper in an inclined position to drain and dry.

THE CONSTRUCTION OF CHIMNEYS.—Many able and scientific men have treated on this subject, but the result of their observations serves only to prove what is the result of every day's experience, namely, that rarefied air is lighter and less dense than cold air; and that it will ascend with a velocity proportionate to its rarefaction, unless obstructed by other bodies. Heat that is generated by the combustion of fuel, exists under two distinct forms, and is known by the names of combustible and radiant heat. Combustible heat partakes of smoke, and is carried off with it into the upper regions, while radiant heat is communicated to opposing bodies in contact with its rays. It is stated by some that combustible heat combined with air and smoke exists in the proportion of four to one, compared to radiant heat: but its correct proportion has perhaps never been ascertained. It is, however, certain that very little radiant heat will escape from a smothered combustion, while a dense smoke will very slowly ascend, and sometimes a portion of it is discharged into the room, and the chimney is pronounced smoky, while the epithets uttered against masons, on such occasions, would be more properly applied to the builders of the fire. As nature acts by certain laws, we may derive more profitable information by a proper observance of them, than from accidental occurrences. It is one of the laws of nature that rarefied air ascends, while cold or dense air descends. On the same principle, water discharges itself more copiously through a channel of a uniform and direct surface, on the same inclination. Therefore, channels that are obstructed by eddies and the discharge of other streams into them, are impeded, and the velocity of the water diminished, so as often to produce what is called back-water

for a considerable distance, which, when removed, permits the water to flow with rapidity. Short bends and turnings also present obstacles to the current or flow of water, by which whirlpools are often seen in actual contact with the natural stream. The same observations may be applied to rarefied air or smoke. Hence those flues will carry smoke the best which arise perpendicularly in a uniform direction. Angles and turnings present obstacles to the progress of the smoke, and should be avoided as much as possible. Particular attention should be paid to the formation of the throat of the chimney, the dimensions of which should in no case exceed the number of square inches contained in a horizontal section of the flue. It has been contended by some that it should be smaller than this, while others have thought that it should be larger ; but experience has shown both of these opinions to be erroneous. When the throat is smaller, the frequent rushes of cold air into it from the opening of doors, etc., sends a gush of smoke into the room, by obstructing the upward current of rarefied air. When the throats are larger, eddies are formed in them, and the smoke, becoming dense by the steam of the fuel, chokes the flue, and instead of ascending is puffed into the room. Experience has shown the best construction to be that where the throat contains as many square inches as a section of the flue. If the latter, for instance, is one hundred and forty-four inches wide, the throat should be four feet long, and three inches wide, nearly on a level with the mantle-bar, or at the top of the opening of the fire-place, and graduated to the regular dimensions of the flue.

GLUEING JOINTS.—In general, nothing more is necessary to glue a joint after the joint is made perfectly straight, or, in technical terms, out of winding, than to glue both edges while the glue is quite hot, and rub them lengthwise until it is nearly set. When the wood is spongy, or sucks up the glue another method must be adopted, one which strengthens the joint, while it does away with the necessity of using the glue too thick, which should always be avoided ; for the less glue there is in contact with the joints, provided they touch, the better ; and when the glue is thick, it chills quickly, and cannot be well rubbed out from between the joints. The method to which we refer is, to rub the joints on the edge with a piece of soft chalk, and, wiping it so as to take off any lumps, glue it in the usual manner ; and it will be found, when the wood is porous, to hold much faster than if used without chalking.

THE NEUTRAL AXIS OF CAST-IRON BEAMS.—"It has long been known that under the existing theory of beams, which recognizes only two elements of strength—namely, the resistances to direct compression and extension—the strength of a bar of cast iron subjected to transverse strain cannot be reconciled with the results obtained from experiments on direct tension, if the neutral axis is in the centre of the bar. The experiments made both in the transverse and on the direct tensile strength of this material have been so numerous and so carefully conducted as to admit of no doubt of their accuracy ; and it results from them, either that the neutral axis must be at or above the top of the beam, or there must mining the position of the neutral axis be made on such a scale and in such a manner as to place this question beyond doubt, and with this object two beams were cast, 7 feet long, 6 inches deep and 2 inches in thickness. Two were employed in order to avoid errors which might arise from accidental irregularities of the metal. Considering the very minute qualities which had to be measured and the numerous causes of disturbance to which observations of so much delicacy were liable, such as changes of temperature or want of perfect uniformity in the dimensions or texture of the beams, the results point out the

position of the neutral axis as the centre of the beam in a manner so decided as to remove all further doubt upon this subject not only in the smaller strains but in the larger ones also, which, in the case of the second beam, were carried to about three-fourths of the breaking weight."

SETTING OUT STAIRS.—After determining the height of the riser from the "storey rod," the right proportion of tread must be found. Sometimes steps are arranged so that it is easier for a man to go up "two at a time" than to walk up in a proper manner. The reason is, both tread and riser are made small. When a riser is reduced the tread must be increased, and the contrary when the riser is increased, the tread must be reduced in width. Joiners do not often break this rule, but masons very often do, notably in steps leading to and from railway stations. A simple rule may be given for finding a suitable proportion. Take any suitable step as a standard step, that is to say, if you know of a staircase which is comfortable and easy to walk up, take it as a standard to guage others by. Supnose you have a riser given, and require the width of a suitable tread, make use of the following proportion: As the given riser : standard riser : : standard tread : required tread. If the tread is given and the riser required, then — as the given tread : standard tread : : standard riser : required riser. To work out an example: Suppose 10 inch tread and 7 inch riser be taken as a suitable step, let 6 inch be the given riser; then by substituting the value of treads and risers, for the names we have — As 6″ : 7″ : : 10″ : required tread; this gives 70-6, or 11⅔ for the size of the tread. Nicholson gives as a standard a tread of 12″ to a riser of 5½″. Working out the example given by this proportion, we get 11″ instead of 11⅔″; either of these sizes will be an agreeable step. The student will find it a good exercise to compare steps of different buildings with any assumed standard. A rough and ready rule, for the usual sizes of treads and risers, is to make two risers and one tread equal to 24 inches. The proper rule given above may be written for convenience as follows:

$$\frac{\text{standard tread} \times \text{standard riser}}{\text{given tread (or riser)}} =$$

required riser (or tread, as the case may be.) Pitch boards should be made of hard wood, and should be tested occasionally, for differences in the temperature have a marked effect on the bevel and length of sides. In setting out strings do not depend upon the pitch board for giving the true lengths of the strings. Set a pair of compasses to the length of the hypothenuse of the pitch board, and mark off along the nosing line the number of steps. In this manner accuracy may be ensured. It is a good practice to mark on the strings and on the drawing the word UP after the number of steps which lands in each flight. This simple habit will prevent the not uncommon mistake of putting a step too many in a flight of stairs. In ramping strings to fit each other, it is necessary for the ramps to finish at right angles to the joints; if they do not, the mould on one string will not intersect with that on the other. The ends of the strings must be prepared to receive skirting before leaving the bench, and it is best generally for the joiner who makes the stairs to work sufficient skirting (to match his strings) to skirt the intermediate landing and the main landings to the nearest architrave. The strings must be gauged, so that there may be a proper margin for plaster. The well strings must be ⅞ inch below the treads or carriages, as the case may be, and the wall string must be flush with them.

SETTING-OUT WINDERS AND NEWELS.—Winders require particular care in setting out; each window must be separately considered; for if not, the beginner will have great difficulty in fixing. When strings are tongued and grooved

rogether, simply putting the tongue on one of them instead of the other will save a great deal of trouble in fixing. This is more particularly the case when the winders finish to a newel or into a solid well. Some times it is a good plan not to "glue up" the winders, for often these winders can be put in when not jointed to the riser. Too often winders are confined to newels at the narrow ends. When winders are set out by means of a falling mould, they are properly arranged and "eased" before reaching the springings. Now the winders round a newel should be similarly situated, although there is no wreath to take into consideration for the steps should begin to narrow gradually. If there is not room in the staircase to move the flyers back for this, the tread of the flyers must be reduced ; a slight reduction will answer the purpose generally. It is a disavantage to have an easy flyer and a steep winder in the same flight of stairs ; the pitch should be as unitorm as possible.

PUTTING STAIRS TOGETHER.—Before wedging up both strings of a flight of stairs in which there are winders, or curved steps to newels, or solid wells, every winder or tread which cannot be fixed after the newel or well is on, must be in position. This is often forgotten by experienced hands and causes a great deal of trouble, such as the breaking of the joint of a winder and riser. If the flight has a cut string, each tread should be screwed to the riser of the next step before the treads are wedged to the wall string ; if the steps are screwed up like this, they can hardly be wedged up "out of square." Strong pieces should be cramped against the nosings until the string board is fixed, blocked and set. The wall strings should be blocked to the treads and risers. Blocks hold the wall string much better than nails through the string into the treads.

SAFE HEIGHTS AND LENGTHS OF BRICK WALLS.—For first-class buildings (the workmanship being good) as a geneaal average the walls should not exceed a greater number of feet in height, than three times their thickness in inches, and the length should not exceed double tne neight, without lateral support or stiffening by pillasters, buttresses or wing walls say for.

	Safe height	Lenght should not exceed.
8½ inch walls	25 feet	50 feet
13 " "	40 "	80 "
18 " "	55 "	110 "
22 " "	65 "	130 "
26 " "	75 "	160 "

Where the length must exceed these distances, as in depots, warehouses, etc., the thickness must be increased. or lateral braces provided (such as plasters or buttresses) and at as short intervals as practicable.

TO MAKE A VERY STRONG GLUE.—An ounce of the best isinglass may be dissolved, by the application of a moderate heat, in a pint of water. Take this solution and strain it through a piece of cloth, and add to it a proportionate quantity of the best glue, which has been previously soaked for about four and twenty hours, and a gill of vinegar. After the whole of the materials have been brought into a solution, let it once boil up, and strain off the impurities. This glue is well adapted for any work which requires particular strength, and where the joints themselves do not contribute towarns the combination of the work, or in small fillets and mouldings, and carved pattera that are held on the surface by the glue

STRENGTH OF STONE MASONRY.

By Prof. I. O. Baker,

The universal custom in determining the ability of stone to resist pressure is to test the compressive resistance of small cubes. The results obtained by testing small specimens of stone are very useful in determining the relative strength of different kinds of stone, but such results are of no value in determining the ultimate strength of the same stone when built into a masonry structure. The strength of a mass of masonry depends on the strength of the stone, on the size of the blocks, on the accuracy of the dressing, on the proportion of headers to stretchers, and on the strength of the mortar. A variation in any one of these items may greatly change the strength of the masonry. The importance of the mortar as affecting the strength of masonry to resist direct compression, is generally overlooked. The mortar acts as a cushion between the blocks of stone, and if it has insufficient strength it will squeeze out lateraly and cause a tensile strain therefore weak mortar causes the stone to fail by tension instead of by compression. Stone is several times stronger to resist compression than tension, and hence, where great strength is required it is necessary that the mortar should be of the best.

No experiments have ever been made, for obvious reasons, upon the strength of stone masonry under the conditions actually occurring in masonry structures; but experiments made upon brick piers 12 inches square and from 2 to 10 feet high, laid in mortar composed of one volume Portland cement and two of sand show that the strength per square inch of the masonry is only about one-sixth of the strength of the brick. An increase of 50 per cent. in the strength of the brick produced no appreciable effect on the strength of the masonry; but the substitution of cement mortar—one part Portland cement and two sand—for lime mortar—one part lime and three parts sand—increased the strength of the masonry 70 per cent. The method of failure of these piers indicates that the mortar squeezed out of the joints and caused the brick to fail by tension. Since the mortar is the weakest element, the less mortar used the stronger the wall; therefore the thinner the joints and the larger the blocks, the stronger the masonry, provided the surfaces of the stone do not come in contact. It is generally stated that the working strain on stone masonry should not exceed one-twentieth to one-tenth of the strength of the stone; but it is clear from the experiments on brick piers referred to above, that the strength of the masonry depends on the strength of the stone only in a remote degree.

In a general way it may be said that the results obtained by testing small cubes may vary 50 per cent. from each other, or say 25 per cent. from the mean, owing to undetected differences in the material, cutting and manner of applying the pressure; and also that stones crack at half of their ultimate crushing strength. Hence, when the greatest care possible is exercised in selecting and bedding the stone, the safe working strength of the stone alone should not be regarded as more than one-fourth to three-eighths of the ultimate strength. A further allowance, depending upon the kind of structure, the quality of mortar, the closeness of the joints, etc., should be made to secure safety. Experiments upon comparatively large specimens are but little help in deciding this question; the only way is to determine the load carried by actual structures. The following are the greatest loads carried by stone masonry, that were discovered by an extended search through engineering literature:

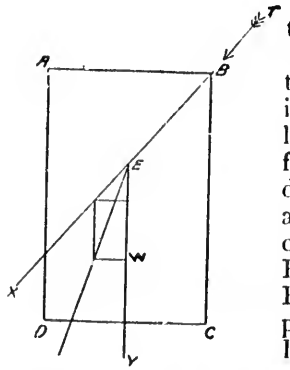
Early builders used much more massive masonry, proportional to the load to be carried, than is customary at present; experience and experiments have shown that such great strength is unnecessary. The load on the monolithic piers supporting the large churches in Europe does not exceed 30 tons per square foot

(420 pounds per square inch) or about one-thirtieth of the ultimate strength of the stone alone. The stone-arch bridge of 140 feet span at Pont-y-tu-Prydd, over the Toff, in France, erected in 1750, is supposed to have a pressure of 20.7 tons per square foot (290 per square inch) on hard limestone rubble masonry laid in lime mortar. A former bridge at the same place failed with 64 tons per square foot. Rennie subjected good hard limestone rubble in columns 4 feet square to 22 tons per square foot, (300 pounds per square inch). The granite piers of the Saltash bridge (England) sustains a pressure of 9 tons per square foot (125 pounds per square inch). The maximum pressure on the granite masonry of the Brooklyn bridge is about 28½ tons per square foot (about 400 pounds per square inch); the maximum pressure on the limestone masonry is about ten tons per square foot (125 pounds per square inch). The face stones ranged in cubical contents from ½ to 5 cubic yards; the stones of the granite backing averaged about 1½ cubic yards, and of the limestone about 1¼ cubic yards per pier. The mortar was 1 volume of Rosendale cement and 2 of sand. The stones were rough axed or pointed to half-inch bed joints, and half-inch vertical face-joints. These towers are very fine examples of the masons' art. The pressure on the limestone piers of the St. Louis bridge was, before completion, 38 tons (527 pounds); after completion the pressure was 19 tons (273 pounds) on the piers and 15 tons (198 pounds) on the abutments. The limestone masonry in the towers of the Niagara Suspension bridge failed under 36 tons per square foot, and were taken down; however, the masonry was not executed. At the South Street bridge, Philadelphia, the pressure on the rubble masonry in the pneumatic piers is 15.7 tons per square foot (220 pounds) at the bottom and 12 tons at the top; this is unusually heavy, but there are no signs of weakness. The maximum pressure on the rubble masonry and cement mortar of some of the large masonry dams is from 10 to 14 tons per square foot. The proposed Quaker bridge dam, which is to impound water for New York City, and which is the largest in the world, is designed for a maximum pressure of 16⅔ tons per square foot on massive rubble masonry in best hydraulic cement mortar.

HOW TO TEST THE DRYNESS OF WALLS.

A curious device for resisting the dryness of walls is described in the *Wiener Bonindustrie-Zuitung*. The apparatus for the purpose consists simply in small sheets of gelatine, which are made by taking the sheet-gelatine of commerce, selecting the thinnest pieces, soaking them for a quarter of an hour in water until they are quite soft, spreading them out flat on a greased sheet of glass, and stretching them with the fingers until the folds and creases are smoothed out and the whole made as thin and uniform as possible. The sheets are then thoroughly dried in the air, the edges, which are rough and uneven, are trimmed off, and the whole cut into pieces about two inches wide and four inches long, for use in testing. If kept flat in a dry place, these gelatine strips are very sensitive to moist air. If a wall is suspected of being damp, a strip is moved slowly over it near its surface, but not touching it. If any damp spots exist, they are immediately shown by the curling of the gelatine as it passes near them. Although every one takes some interest in knowing whether his house is dry or not, this simple test is likely to be of more practical use to fresco-painters and paper hangers than to any one else. Both of these, to avoid disappointment and loss, need to know with certainty whether the walls and ceilings on which their art is to be exercised are dry or not, as their paper and colors will often change on damp plastering. In the case of a wall of masonry, particularly, plastered on the brick work it is difficult to tell by ordinary inspection whether the moisture has dried out or not, and the gelatine sheets may give the desired information with such certainty and precision as to be of great service.

GRAPHIC METHOD OF DETERMINING THE STABILITY OF A PIER OR BUTTRESS.



Let A B C D represent a pier which sustains a given thrust T, at B.

Draw the indefinite line BX in the direction of the thrust through the centre of gravity of the pier (which in this case is at the centre of the pier), draw a vertical line until it intersects the line of the thrust at E. As a force may be considered to act anywhere in its line of direction, we may consider the thrust and the weight to act at the point E ; and the resultant of these two forces can be obtained by laying off the thrust T from E on E X, and the weight of the pier W from E on the line E Y both to the same scale (pounds to the inch) completing the parallelogram and drawing the diagonal. If this diagonal prolonged cuts the base upon the outer edge, the pier will be unstable and its dimensions must be changed. *The stability of a pier* may be increased by adding to its weight by placing some heavy material on top or by increasing its width at the base by means of "set-offs."

[*Kidder.*]

BONDING WITH HOOP IRON.

Hoop iron is in narrow strips about an inch in breadth, and for bonding is generally dipped in hot tar before being built into a wall to preserve it from rust. It is often laid in the centre of a thin wall, but there should be one hoop iron to every half brick in thickness of wall. Two courses of hoop iron should be built into every story, one below the window sill and one above the head, but where the expense can be permitted it may be placed in every few courses of brick. The ends of the iron lengthways should overlap and be hooked together, and at angles of wall the iron should also be hooked together

WATERPROOFING STONEWORK.

Coal tar is recommended for waterproofing masonry. For exposed surfaces apply from one to three coats boiling hot. By adding a small quantity of India rubber dissolved in benzine the coating will last longer. To whiten the color, dust with plaster of Paris before dry. For surfaces to be covered by earth a single coating of tar made thick by blazing is preferable ; two or three gallons should be boiled and lighted when boiling. While blazing stir continually till volume is reduced and becomes pasty in cooling. Spread over stone rapidly with large flat brush.

BOILER SETTING.

Brickwork for boiler setting is very different from ordinary brickwork The joints should be very thin and both inside and out must be very carefully executed. Kaolin or prepared fire clay should be used as mortar for the fire brick and mixed so thin that it must be put on with iron spoons instead of trowels. The fire brick should be dipped in water before laying so that it will take up the water in the cement. Every sixth course beginning with the grates should be headers well bonded into the rear work ; they must be well bonded into the setting to hold upper part of wall in position as the lower courses of fire brick burn away. This admits of replacing of fire bricks without rebuilding the wall

LIMESTONES.

Limstones are for many reasons eminently suitable for constructive purposes, being cheap and easily worked, but they readily absorb moisture. This moisture usually contains carbonic acid and gradually dissolves the stone, and in winter serious injury is often caused by the freezing of the moisture and its subsequent expansion. Recent experiments prove that metallic fluosilicates, more especially those of aluminium, magnesium and zinc, are successful preservatives. The surfaces should be brushed over with a solution of salt chlorine, causing on first application an abundant froth, due to the liberation of carbonic acid gas. When dry, wash over again once or twice according to the quality of the stone; on an average, 1.7 pounds of solution to 40° Beaume are required per cubic yard. The process is completed in 24 hours. This treatment admits of polishing of the stone, and by a suitable choice fluosilicate used, different colors can be communicated to the stone. The process is cheap and good alike for mortars and cement containing lime.

SAND FOR CONCRETE OR MORTAR.

Sand when rubbed in the hand should give a dry crackling sound and be prickly to the skin. Clean and sharp sand if wetted and taken up in the hand, after being tightly held will not, on being loosed, retain the shape nor soil the hand.

[*T. M. Clarke*]

INVERTED ARCHES.

A foundation or basement of piers constructed with badly formed inverted arches is worse than if the arches had been omitted altogether. They are introduced for the purpose of distributing the superincumbent weight and are intended to obviate a solid wall. By means of the inverted arch the whole weight of the building is distributed over the whole foundation, and it is necessary that the outer arch at each end of the wall should have a sufficient abutment to prevent the arch pushing out the final piers. The inverted arch, when used, should be the full thickness of the piers against which it abuts. Semi-ellipse is a good form, but it should be built of particularly good brick set in quick setting cement, the cement joints being very fine. The rims of the arch should not be more than half brick in height, and nothing should be built upon the intrados. If it is necessary to build solid above the arch a stone should be inserted above the abutment of the arch, and the upper work should rest on it. Great care must be taken to form the abutmeat, which must be above the top course of the footings of the piers.

ARCHES.

In constructing arches of wide spans, an important factor of safety is the thickness of the material from the intrados to the extrados, especially at the crown or keystone. Several rules for determining the depth of the keystone have been devised, but there is a very wide difference between them. Prof. Rankine's rule, however, seems to answer for most purposes: "Take the mean proportional between the inside radius at the crown and 0.12 of a foot for a single arch, and 0.17 of a foot for an arch forming one of a series.

Formulæ:

Depth of keystone for single arch in feet $= \sqrt{(0.12 \times \text{radius at crown.}}$

Depth of keystone for an arch of a series in feet $= (0.17 \times \text{radius at crown.})$

LAMINATION IN STONE.

All sandstones may be grouped in three ways: (1) those that are very hard, very compact, very fine in grain, and generally speaking of a pale color; (2) those that are durable but costly; (3) those that are hard and laminated. That is the character that belongs to almost all rocks that have been found in water, but in some it shows itself more markedly than in others. In stones that are completely laminated the appearance is like sheets of paper placed one over the other, and you can almost separate them. These stones are easily perishable. There are, however, laminated stones of good quality. These are generally not of fine grain, although they may be so. They are most frequently of a mixed grain made up of particles of sand and small pebbles of different sizes. Very often they have reddish tints of color owing to the presence of iron, and they are often very irregular in their character. There are some soft stones which are laminated and generally red, but soft and bad. These are the three kinds of sand stones. They are subject to decay in this way: First, from lamination. Having been formed in water, they have been deposited in beds one over the other and never become entirely free from water, and when exposed to the air are liable to give off the water by evaporation and take it again by absorption when rain comes or when the air is damp. After this if a change of temperature follows and a severe cold sets in, the temperature of the stone passing below the point of the extreme density of water, the water begins to expand. Then again, water contains foreign substances floating in the atmosphere which are soluble in water. These substances include a large number of gases; acid gases for the most part, but some others. For example, they include carbonic acid gas, and carbonic acid dissolves in water; they include also sulphuric acid, and this is taken up by the water; also sulphate of ammonia, all these substances being produced in the atmosphere of large towns. These substances entering into the body of the stone begin to act upon the cementing medium. If the cementing medium is easily acted upon chemically by these substances, it is, of course, very soon removed. If it is not easily affected by them, then the stone remains unaltered; but generally speaking, it is the case that sandstones that have either lime or clay as their cementing medium are more or less affected by foreign substances entering into them through the atmosphere. There is then a cause of decay in the sandstones, and the sandstones, when they are very absorbent, generally become readily disintegrated in this manner.

TABLE SHOWING PERMISSIBLE LOADS UPON VARIOUS KINDS OF FOUNDATION BEDS, PER SQUARE FOOT.

Rock foundations, 4,000 to 40,000 lbs., aver.....	20,000 lbs.
Coarse gravel and sand	2,500 to 3,500 lbs.
Clay.....	4,000 lbs.
Concrete.....	8,000 lbs.
Piles in artificial soil, for each pile	4,000 lbs.
Piles in firm soil, for each pile.....	30,000 to 140,000 lbs.

[*Kidder's Pocket Book.*]

THICKNESS OF WALLS IN DWELLING HOUSES—BRICK.

Height	Length up to 45 feet.	Length up to 80 feet.	Length unlimited.
Height up to 100 feet.	Two stories 21½ in. Three " 17½ in. Remainder 13 in.	Two stories 26 in. " 21½ in. " 17½ in. Remainder 13 in.	One story 30 in. Two stories 26 in. " 21½ in. " 17½ in. Remainder 13 in.
Height	Length up to 45 feet.	Length up to 70 feet.	Length unlimited.
Height up to 90 feet.	Two stories 21½ in. " 17½ in. Remainder 13 in.	One story 26 in. Two stories 21½ in. " 17½ in. Remainder 13 in.	One story 30 in. Two stories 26 in. One story 21½ in. Two stories 17½ in. Remainder 13 in.
Height	Length up to 40 feet.	Length up to 60 feet.	Length unlimited.
Height up to 80 feet.	One story 21½ in. Two stories 27½ in. Remainder 13 in.	Two stories 21½ in. " 17½ in. Remainder 13 in.	One story 26 in. Two stories 21½ in. " 17½ in. Remainder 13 in.
Height	Length up to 40 feet.	Length up to 55 feet.	Length unlimited.
Height up to 70 feet.	Two stories 17½ in. Remainder 13 in.	One story 21½ in. Two stories 17½ in. Remainder 13 in.	One story 26 in. Two stories 21½ in. One story 17 in. Remainder 13 in.
Height	Length up to 30 feet.	Length up to 50 feet.	Length unlimited.
Height up to 60 feet.	One story 17½ in. Remainder 13 in.	Two stories 17½ in. Remainder 13 in.	One story 21½ in. Two stories 17½ in. Remainder 13 in.
Height	Length up to 30 feet.	Length up to 45 feet.	Length unlimited.
Height up to 50 feet.	Wall below the top story 13 in. Top story 8½ in. Remainder 8½ in.	One story 17½ in. Rest of wall below top story 13 in. Top story 8½ in. Remainder 8½ in.	One story 21½ in. " 17½ in. Remainder 13 in.

TABLE SHOWING NUMBER OF BRICKS IN WALLS OF VARIOUS THICKNESSES.

Superficies of wall.	THICKNESS OF WALLS.									
	4½ in. or ½ brick	9 in. or 1 brick	13 in. or 1½ brick	18 in. or 2 brick	22 in. or 2½ brick	26 in. or 3 brick	30 in. or 3½ brick	35 in. or 4 brick	39 in. or 4½ brick	44 in. or 5 brick
ft in.										
0.6	3½	7	10½	14	17½	21	24½	28	31½	35
1.0	7	14	21	28	35	42	49	56	63	70
1.6	10½	21	31½	42	52½	63	73½	84	94½	105
2.0	14	28	42	56	70	84	98	112	126	140
2.6	17½	35	52½	70	87½	105	122½	140	157½	175
3.0	21	42	63	84	105	126	147	168	189	210
3.6	24½	49	73½	98	122½	147	171½	196	220½	245
4.0	28	56	84	112	140	168	196	224	252	280
4.6	31½	63	94½	126	157½	189	220½	252	283½	315
5.0	35	70	105	140	175	210	245	280	315	350
5.6	38½	77	115½	154	192½	231	269½	308	346½	385
6.0	42	84	126	168	210	252	294	336	378	420
6.6	45½	91	136½	182	227½	273	318½	364	409½	455
7.0	49	98	147	196	245	294	343	392	441	490
7.6	52½	105	157½	210	262½	315	367½	420	472½	525
8.0	56	112	168	224	280	336	392	448	504	560
8.6	59½	119	178½	238	297½	357	416½	476	535½	595
9.0	63	126	189	252	315	378	441	504	567	630
9.6	66½	133	199½	266	332½	399	465½	532	598½	665
10.0	70	140	210	280	350	420	490	560	630	700
15.0	105	210	315	420	525	630	735	840	945	1050
20.0	140	280	420	560	700	840	980	1120	1260	1400
30.0	210	420	630	840	1050	1260	1470	1680	1890	2100
40.0	280	560	840	1120	1400	1680	1960	2240	2520	2800
50.0	350	700	1050	1400	1750	2100	2450	2800	3150	3500
60.0	420	840	1260	1680	2100	2520	2940	3360	3780	4200
70.0	490	980	1470	1960	2450	2940	3430	3920	4410	4900
80.0	560	1120	1680	2240	2800	3360	3920	4480	5040	5600
90.0	630	1260	1890	2520	3150	3780	4410	5040	5670	6300
100.0	700	1400	2100	2800	3500	4200	4900	5600	6300	7000
200.0	1400	2800	4200	5600	7000	8400	9800	11200	12600	14000
300.0	2100	4200	6300	8400	10500	12600	14700	16800	18900	21000
400.0	2800	5600	8400	11200	14000	16800	19600	22400	25200	28000
500.0	3500	7000	10500	14000	17500	21000	24500	28000	31500	35000
600.0	4200	8400	12600	16800	21000	25200	29400	33600	37800	42000
700.0	4900	9800	14700	19600	24500	29400	34300	39200	44100	49000
800.0	5600	11200	16800	22400	28000	33600	39200	44800	50400	56000
900.0	6300	12600	18900	25200	31500	37800	44100	50400	56700	63000
1000.0	7000	14000	21000	28000	35000	42000	49000	56000	63000	70000

TABLE OF KEYSTONES FOR ARCHES OF FIRST-CLASS CUT STONE.

(From Trautwine's C. E. Handbook.)

For second-class cut stone add about one-eighth part.
For good rubble or brick add about one-fourth part.

Span in feet.	RISE IN PARTS OF THE SPAN.						
	½	⅓	¼	1/5	⅙	⅛	1/10
	Key ft.	Key ft.	Key ft.	Key ft.	Key ft.	Key ft.	Key ft.
2	0.55	0.56	0.58	0.60	0.61	0.64	0.68
4	0.70	0.72	0.74	0.76	0.79	0.83	0.88
6	0 81	0.83	0.86	0.89	0.92	0.97	1.03
8	0.91	0.93	0.96	1.00	1.03	1.09	1.16
10	0.99	1.01	1.04	1.07	1.11	1.18	1.26
15	1.17	1.19	1.22	1.26	1.30	1.40	1.50
20	1.32	1.35	1.38	1.43	1.48	1.59	1.70
25	1.45	1.48	1.53	1.58	1.64	1.76	1.88
30	1.57	1.60	1.65	1.71	1.78	1.91	2.04
35	1.68	1.70	1.76	1.83	1.90	2.04	2.19
40	1.78	1.81	1.88	1.95	2.03	2.18	2.33
50	1.97	2.00	2.08	2.16	2.25	2.41	2.58
60	2.14	2.18	2.26	2.35	2.44	2.62	2.80
80	2.44	2.49	2.58	2.68	2.78	2.98	3.18
100	2.70	2.75	2.86	2.97	3.09	3.32	3.55
120	2.94	2.99	3.10	3.22	3.35	3.61	3.88
140	3.16	3.21	3.33	3.46	3.60	3 87	4.15
160	3.36	3.44	3.58	3.72	3.87	4.17	
180	3.56	3.63	3.75	3.90	4.06	4.38	
200	3.74	3.81	3.95	4.12	4.29		
220	3.91	4.00	4.13	4.30	4.48		
240	4.07	4.15	4.30	4.48			
260	4.23	4.31	4.47	4.66			
280	4.38	4.46	4.63				
300	4.53	4.62	4.80				

CRUSHING STRENGTH OF BRICKWORK.

[*F. E. Kidder.*]

Piers, uniform size, 8″ x 12″ x 22½″ high, common mortar, good average quality, Cement, pure Portland, ½ inch thick under and on top of each pier. Age of piers, 4 months 26 days, exposed to air only, not in water.

COMPOSITION OF MORTAR, ETC.	Ultimate strength of pier.	Strength per sq. in.	Pressure per sq. in. when piers shewed first sign of yielding.	Tons per sq. feet borne when piers first yielded.
	lbs.	lbs.	lbs.	tons.
Lime mortar, plain	150,000	1,562	833	59
Lime mortar 3 parts, Rosendale cement, 1 part	245,000	2,552	1,354	97
Lime mortar 3 parts, Roman cement 1 part	195,000	2,030	1,041	75
Portland cement 1 part, sand 2 parts	240,000	2,500	1,302	93
Newark and Rosendale cement 1 part, sand 2 parts	205,000	2,135	708	51
Roman cement 1 part, sand 2 parts	185,000	1,927	1,770	127

Maximum crushing weight of walls built of good hard burned bricks laid in good lime and sand mortar, per sq. inch ..... 1,500 lbs.
Maximum crushing weight of walls built of good hard burned bricks laid in good lime and sand mortar, per sq. foot ..... 216,000 lbs.
Maximum crushing weight of walls built of best hard bricks in Portland cement mortar, ⅓ cement, per sq. inch ..... 2,500 lbs.
Maximum crushing weight of walls built of best hard bricks in Portland cement mortar, ⅓ cement, per sq. foot ..... 360,000 lbs.

Results of from 30 per cent. to 50 per cent. lower have been obtained by previous competent authorities.

Bricks used for the Indiana Statehouse (F. W. Vogdes' Sup.) specimens having been rubbed to parallel faces and averaging 4″ x 8″ x 2⅛″ = 32″ sup., were tested separately without mortar and bore a pressure of 55 tons before yielding, crushing under 80 tons; this was the lowest grade admitted, the pressure being equal to 5,600 lbs. per square inch. Of the specimens tested, the results varied from crushing under 40 tons to remaining uninjured while bearing a pressure of 97½ tons (equal to 6,825 lbs. per sq. in.) for 15 minutes. Of Philadelphia face-brick (best) used in Municipal Buildings, Philadelphia, the tests gave for one specimen 15,240 lbs. per square inch and another 10,240 lbs. per square inch.

[*Vogdes' "Pocket Companion."*]

TO PREDETERMINE EFFLORESCENCE ON BRICKWORK.

It is possible to determine in advance of their use whether bricks will effloresce. Knowing this, architects and builders should permit the use of none that will not stand the test. At the Royal testing station of building material in Berlin bricks are gradually heated to the boiling point in a water bath and are then suddenly immersed in cold water. They are boiled for one hour in a 15 per cent. solution of common salt and frequently cooled as before. They are again boiled half an hour in 5 per cent. soda lye. They are further boiled half an hour in the same solution with the addition of 1 per cent. of ammonium sulphate. They are then boiled half an hour in a solution containing 2 per cent. blue vitriol and 10 per cent. common salt. Fragments of the brick are placed for 75 hours in *3 per cent.* hydrochloric acid, and for 50 hours more in *5 per cent.* hydrochloric acid. By further treatment of the fragments with pure 4 per cent. hydrochloric acid a fluid clear as water is formed, which when treated with barium salts should not show the presence of sulphates, which are the cause of efforescence. These tests determine the quality of the bricks as well, and none which fail to stand the test should be used. It may be only necessary to test a few samples of brick from each brick yard when the general quality of the clay from which the bricks are made will be ascertained.

Table Showing Diameter and Height of Chimney for any Boiler.

(Kidder's Hand Book.)

Horse power of boiler.	Height of chimney in feet.	Interior diameter at top.	Horse power of boiler.	Height of chimney in feet.	Interior diameter at top.
10	60	14 inches.	70	120	30 inches.
12	75	14 "	80	120	34 "
16	90	16 "	120	135	38 "
20	99	17 "	160	150	43 "
30	105	21 "	200	165	47 "
50	120	26 "	250	180	52 "
60	120	27 "	380	195	57 "

GENERAL RULES FOR BRICK CHIMNEYS.

(Molesworth.)

The diameter at the base should be not less than one-tenth of the height.

Batter of chimneys 0.3 inch to the foot.

THICKNESS OF BRICKWORK:

One brick, from top to 25 feet from top.

Brick and a half, from 25 feet from top to 50 feet from top.

Increase thickness by half a brick for each 25 feet from top.

If the inside diameter at top exceeds 4 feet 6 inches the top length should be a brick and a half.

AREA OF CHIMNEYS:

Q = Quantity of coal consumed per hour in lbs.

H = Height of chimney in feet.

P = Indicated horse power of engine.

A = Area of chimney at top in square inches.

$$A = \frac{15\,Q}{\sqrt{H}} = \frac{150\,P}{\sqrt{H}}$$

The area for entrance of air to ash pit should be ¼ the area of grate, 2 feet 6 inches is sufficient depth. The grate bars inclining downwards 1 in. per foot, not more than ¾ in. thick and ⅜ to ½ in. spaces between. The furnace should have 3 cubic feet of space above each superficial foot of grate bar surface.

[*Jones & Laughlin.*]

TABLE OF SAFE LOADS,

UNIFORMLY DISTRIBUTED, FOR WHITE PINE BEAMS, SUPPORTED AT BOTH ENDS IN TONS OF 2,000 POUNDS.

BEAMS 6 INCHES DEEP.					BEAMS 7 INCHES DEEP.					
Clear span in feet.	BREADTH.				Clear span in feet.	BREADTH.				
	3 in.	4 in.	5 in.	6 in.		3 in.	4 in.	5 in.	6 in.	7 in.
2	3.	4.	5.	6.	2	4.1	5.4	6.8	8.2	9.5
3	2.	2.7	3.3	4.	3	2.7	3.6	4.5	5.4	6.3
4	1.5	2.	2.5	3.	4	2.1	2.7	3.4	4.1	4.6
5	1.2	1.6	2.	2.4	5	1.6	2.2	2.7	3.2	3.8
6	1.	1.3	1.6	2.	6	1.4	1.8	2.2	2.7	3.1
7	.84	1.1	1.4	1.7	7	1.2	1.5	1.9	2.3	2.7
8	.73	.98	1.2	1.5	8	1.	1.3	1.7	2.	2.3
9	.64	.86	1.1	1.3	9	.88	1.2	1.5	1.8	2.1
10	.58	.77	.96	1.2	10	.79	1.1	1.3	1.6	1.8
11	.52	.7	.87	1.1	11	.7	.93	1.2	1.4	1.6
12	.49	.63	.79	.95	12	.65	.86	1.1	1.3	1.5
14	.39	.53	.66	.79	14	.55	.73	.91	1.1	1.3
16	.34	.46	.56	.68	16	.47	.62	.78	.94	1.1
18	.28	.4	.49	.59	18	.41	.54	.67	.82	.95

Safe Load, uniformly distributed, for White Pine Beams, supported at both ends, in Tons of 2000 lbs.

Clear span in ft.	BEAMS 10″ DEEP. BREADTH. 4″	5″	6″	7″	8″	9″	10″	Clear span in ft.	BEAMS 11″ DEEP. BREADTH. 5″	6″	7″	8″	9″	10″	11″
4	5.5	6	9	8.3	9.7	11.1	12.4	13.8	4	8.4	10.1	12.7	13.4	15.1	16.7	18.4
5	4.4	5.5	6.6	7.7	8.8	9.9	11.		5	6.7	8.	9.4	10.7	12.	13.4	14.7
6	3.7	4.6	5.5	6.4	7.3	8.3	9.2		6	5.6	6.7	7.8	8.9	10.	11.1	12.2
7	3.1	3.9	4.7	5.5	6.2	7.1	7.9		7	4.8	5.7	6.7	7.6	8.6	9.5	10.5
8	2.7	3.4	4.1	4.8	5.5	6.	6.8		8	4.1	5.	5.8	6.6	7.5	8.3	9.1
9	2.4	3.	3.6	4.2	4.8	5.4	6.		9	3.7	4.4	5.1	5.9	6.6	7.3	8.1
10	2.2	2.7	3.3	3.8	4.3	4.9	5.4		10	3.3	4.	4.6	5.3	5.9	6.6	7.2
11	2.	2.5	2.9	3.4	3.9	4.4	4.9		11	3.	3.6	4.2	4.8	5.4	6.	6.6
12	1.8	2.2	2.7	3.1	3.6	4.	4.5		12	2.7	3.3	3.8	4.4	4.9	5.4	6.
14	1.5	1.9	2.3	2.7	3.	3.3	3.8		14	2.4	2.8	3.2	3.7	4.1	4.6	5.1
16	1.3	1.6	2.	2.3	2.6	2.9	3.3		16	2.	2.4	2.8	3.3	3.6	4.	4.4
18	1.1	1.4	1.7	2.	2.3	2.6	2.8		18	1.7	2.1	2.4	2.8	3.2	3.5	3.8
20	1.	1.3	1.5	1.8	2.	2.3	2.5		20	1.5	1.9	2.2	2.5	2.8	3.1	3.4
22	.9	1.1	1.3	1.6	1.8	2.	2.2		22	1.4	1.7	1.9	2.2	2.5	2.8	3.
24	.8	1.	1.1	1.4	1.6	1.8	2.		24	1.2	1.5	1.7	2.	2.2	2.5	2.7

Safe Load, uniformly distributed, for White Pine Beams, supported at both ends, in tons of 2000 lbs.

Clear span in ft.	BEAMS 13″ DEEP. BREADTH. 3″	4″	5″	6″	7″	8″	9″	10″	11″	12″	13″
6	4.7	6.2	7.8	9.3	10.9	12.4	14.	15.5	17.1	18.6	20.2
7	4.	5.4	6.7	8.1	9.4	10.7	12.1	13.4	14.8	16.1	17.4
8	3.5	4.6	5.8	7.	8.1	9.3	10.4	11.6	12.8	13.9	15.1
9	3.1	4.1	5.1	6.2	7.2	8.2	9.3	10.3	11.3	12.3	13.4
10	2.8	3.7	4.6	5.5	6.5	7.4	8.3	9.2	10.1	11.1	12.
11	2.5	3.3	4.2	5.	5.8	6.7	7.5	8.4	9.2	10.	10.9
12	2.3	3.1	3.8	4.6	5.3	6.1	6.9	7.6	8.4	9.2	9.9
14	1.9	2.6	3.2	3.9	4.5	5.2	5.8	6.5	7.1	7.8	8.4
16	1.7	2.2	2.8	3.4	3.9	4.5	5.	5.6	6.2	6.7	7.3
18	1.5	2.	2.5	3.	3.4	3.9	4.4	4.9	5.4	5.9	6.4
20	1.3	1.7	2.2	2.6	3.1	3.5	3.9	4.4	4.8	5.2	5.7
22	1.2	1.6	2.	2.3	2.7	3.1	3.5	3.9	4.3	4.7	5.1
24	1.1	1.4	1.8	2.1	2.5	2.8	3.2	3.5	3.9	4.2	4.6
26	1.	1.3	1.6	1.9	2.2	2.6	2.9	3.2	3.5	3.8	4.1
28	.9	1.2	1.5	1.7	2.	2.3	2.6	2.9	3.2	3.5	3.8

Safe Live Load, uniformly distributed, for White Pine Beams, supported at both ends, in tons of 2000 lbs.

Clear span in ft.	BEAMS 8″ DEEP. BREADTH. 3″	4″	5″	6″	7″	8″	Clear span in ft.	BEAMS 9″ DEEP. BREADTH. 3″	4″	5″	6″	7″	8″	9″
3	3.5	4.7	5.9	7.1	8.3	9.5	3	4.5	6.	7.5	9.	10.5	12.	13.5
4	2.7	3.5	4.4	5.3	6.2	7.1	4	3.4	4.5	5.6	6.7	7.8	9.	10.1
5	2.1	2.8	3.5	4.2	4.9	5.6	5	2.7	3.6	4.5	5.4	6.3	7.2	8.1
6	1.8	2.4	2.9	3.5	4.1	4.7	6	2.2	3.	3.7	4.5	5.2	5.9	6.4
7	1.5	2.	2.5	3.	3.5	4.	7	1.9	2.5	3.2	3.8	4.4	5.1	5.7
8	1.3	1.8	2.2	2.6	3.	3.5	8	1.7	2.2	2.8	3.3	3.9	4.4	5.
9	1.2	1.6	1.9	2.3	2.7	3.1	9	1.5	2.	2.4	2.9	3.4	3.9	4.4
10	1.	1.4	1.7	2.1	2.4	2.8	10	1.3	1.8	2.2	2.6	3.1	3.5	4.
11	.92	1.3	1.6	1.9	2.2	2.5	11	1.2	1.6	2.	2.4	2.8	3.2	3.6
12	.84	1.1	1.4	1.7	2.	2.3	12	1.1	1.4	1.8	2.2	2.5	2.9	3.3
14	.71	1.	1.2	1.4	1.7	1.9	14	.92	1.2	1.5	1.8	2.1	2.4	2.8
16	.6	.82	1.	1.2	1.4	1.6	16	.8	1.	1.3	1.6	1.8	2.1	2.4
18	.52	.72	.9	1.1	1.3	1.4	18	.68	.91	1.1	1.4	1.6	1.8	2.
20	.45	.64	.8	.9	1.1	1.3	20	.61	.81	1.	1.2	1.4	1.6	1.8
22	.42	.52	.7	.8	1.	1.1	22	.54	.72	.9	1.1	1.2	1.4	1.6

Safe Load, uniformly distributed, for White Pine Beams, supported at both ends, in Tons of 2000 lbs.

Clear span in ft.	BEAMS 12″ DEEP. BREADTH. 3″	4″	5″	6″	7″	8″	9″	10″	11″	12″
6	4.	5.3	6.6	7.9	9.3	10.6	11.9	13.2	14.6	15.9
7	3.4	4.5	5.7	6.8	7.9	9.1	10.2	11.3	12.5	13.6
8	3.	4.	4.9	5.9	6.9	7.9	8.9	9.9	10.9	11.8
9	2.6	3.5	4.4	5.3	6.1	7.	7.9	8.8	9.7	10.5
10	2.4	3.1	3.9	4.7	5.5	6.3	7.1	7.8	8.6	9.4
11	2.1	2.8	3.6	4.3	5.	5.7	6.4	7.1	7.8	8.6
12	1.9	2.6	3.2	3.9	4.5	5.2	5.8	6.5	7.1	7.8
14	1.6	2.2	2.8	3.3	3.9	4.4	5.	5.5	6.1	6.6
16	1.4	1.9	2.4	2.9	3.3	3.8	4.3	4.8	5.2	5.7
18	1.3	1.7	2.1	2.5	2.9	3.3	3.8	4.2	4.6	5.
20	1.1	1.5	1.9	2.2	2.6	3.	3.4	3.7	4.1	4.4
22	1.	1.3	1.7	2.	2.3	2.6	3.	3.3	3.6	4.
24	.9	1.2	1.5	1.8	2.1	2.4	2.7	3.	3.3	3.6
26	.8	1.1	1.3	1.6	1.9	2.2	2.4	2.7	3.	3.2
28	.7	1.	1.2	1.5	1.7	1.9	2.2	2.4	2.7	2.9

Safe Load, uniformly distributed, for White Pine Beams, supported at both ends, in tons of 2000 lbs.

BEAMS 15″ DEEP.

Clear span in ft.	BREADTH.												
	3″	4″	5″	6″	7″	8″	9″	10″	11″	12″	13″	14″	15″
6	6.2	8.3	10.4	12.4	14.5	16.6	18.6	20.7	22.8	24.9	26.9	29.	31.1
7	5.2	7.	8.7	10.5	12.2	14.	15.7	17.5	19.2	21.	22.7	24.5	26.2
8	4.6	6.2	7.7	9.3	10.8	12.4	13.9	15.5	17.	18.6	20.1	21.7	23.2
9	4.1	5.4	6.8	8.2	9.5	10.9	12.3	13.6	15.	16.3	17.7	19.1	20.4
10	3.7	4.9	6.2	7.4	8.6	9.8	11.1	12.3	13.5	14.8	16.	17.2	18.5
11	3.3	4.5	5.6	6.7	7.8	8.9	10.	11.2	12.3	13.4	14.5	15.6	16.7
12	3.1	4.1	5.1	6.1	7.1	8.2	9.2	10.2	11.2	12.2	13.2	14.3	15.3
14	2.6	3.4	4.3	5.2	6.1	7.	7.9	8.7	9.6	10.5	11.4	12.3	13.1
16	2.3	3.	3.8	4.5	5.3	6.	6.8	7.5	8.3	9.	9.8	10.5	11.3
18	2.	2.6	3.3	3.9	4.6	5.2	5.9	6.5	7.2	7.9	8.5	9.2	9.8
20	1.8	2.4	2.9	3.5	4.1	4.7	5.3	5.9	6.5	7.1	7.6	8.2	8.8
22	1.6	2.1	2.6	3.2	3.7	4.1	4.6	5.2	5.7	6.2	6.7	7.3	7.8
24	1.4	1.9	2.4	2.9	3.3	3.8	4.3	4.8	5.2	5.7	6.2	6.7	7.1
26	1.3	1.7	2.2	2.6	3.	3.5	3.9	4.3	4.7	5.2	5.6	6.	6.5
28	1.2	1.6	1.9	2.3	2.7	3.1	3.5	3.9	4.3	4.7	5.	5.4	5.8

Strength of White Pine Struts or Pillars.

Length in feet.	Dimensions of Cross-Sections in Ins. Safe load in tons of 2000 lbs.											
	4×5	4×6	4×7	4×8	4×9	4×10	4×11	4×12				
6	4.1	5.0	5.8	6.6	7.4	8.3	9.1	9.9				
7	3.8	4.5	5.3	6.0	6.8	7.5	8.3	9.0				
8	3.5	4.2	4.9	5.6	6.3	7.0	7.7	8.4				
9	3.2	3.9	4.6	5.2	5.9	6.5	7.2	7.8				
10	2.9	3.5	4.0	4.6	5.2	5.8	6.3	6.9				
11	2.6	3.2	3.7	4.2	4.7	5.3	5.8	6.3				
12	2.4	2.9	3.3	3.8	4.3	4.7	5.2	5.7				
13	2.0	2.4	2.8	3.2	3.6	4.0	4.4	4.8				
14	1.8	2.1	2.3	2.6	3.0	3.5	3.9	4.3				
15	1.4	1.7	1.9	2.2	2.5	2.8	3.0	3.3				
16	1.1	1.4	1.6	1.8	2.0	2.3	2.5	2.7				
17	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4				
18	0.9	1.1	1.2	1.4	1.6	1.8	1.9	2.1				

Safe Load, uniformly distributed, for White Pine Beams, supported at both ends, in tons of 2000 lbs.

BEAMS 14″ DEEP.

Clear span in ft.	BREADTH.											
	3″	4″	5″	6″	7″	8″	9″	10″	11″	12″	13″	14″
6	5.4	7.2	9.	10.8	12.6	14.4	16.2	18.	19.8	21.6	23.4	25.2
7	4.6	6.2	7.7	9.2	10.8	12.3	13.9	15.4	16.9	18.5	20.	21.5
8	4.	5.4	6.7	8.1	9.4	10.8	12.1	13.2	14.8	16.1	17.5	18.8
9	3.6	4.8	6.	7.2	8.3	9.5	10.7	11.9	13.1	14.3	15.5	16.7
10	3.3	4.3	5.4	6.5	7.5	8.6	9.7	10.7	11.8	12.9	14.	15.
11	2.9	3.9	4.8	5.8	6.8	7.8	8.7	9.7	10.7	11.6	12.6	13.6
12	2.7	3.5	4.4	5.3	6.2	7.1	8.	8.9	9.7	10.6	11.5	12.4
14	2.3	3.	3.8	4.5	5.3	6.	6.8	7.5	8.3	9.	9.8	10.5
16	2.	2.6	3.3	3.9	4.6	5.2	5.9	6.5	7.2	7.8	8.5	9.1
18	1.8	2.3	2.9	3.5	4.1	4.7	5.3	5.9	6.5	7.1	7.6	8.2
20	1.5	2.	2.5	3.1	3.6	4.1	4.6	5.1	5.6	6.1	6.6	7.1
22	1.4	1.8	2.3	2.7	3.2	3.6	4.1	4.6	5.	5.5	5.9	6.4
24	1.2	1.6	2.1	2.5	2.9	3.3	3.7	4.1	4.5	4.9	5.3	5.8
26	1.1	1.5	1.9	2.2	2.6	3.	3.4	3.7	4.1	4.5	4.8	5.2
28	1.	1.4	1.7	2.	2.4	2.7	3.1	3.4	3.7	4.1	4.4	4.8

Safe Load, uniformly distributed, for White Pine Beams, supported at both ends, in tons of 2000 lbs.

BEAMS 16″ DEEP.

Clear span in ft.	BREADTH.													
	3″	4″	5″	6″	7″	8″	9″	10″	11″	12″	13″	14″	15″	16″
6	7.1	9.4	11.8	14.1	16.5	18.9	21.2	23.6	25.9	28.3	30.6	33.	35.4	37.7
7	6.1	8.1	10.1	12.1	14.1	16.1	18.1	20.2	22.2	24.2	26.2	28.2	30.2	32.3
8	5.3	7.	8.8	10.6	12.3	14.1	15.8	17.6	19.4	21.1	22.9	24.7	26.4	28.2
9	4.7	6.2	7.8	9.4	10.9	12.5	14.1	15.6	17.2	18.7	20.3	21.9	23.4	25.
10	4.2	5.6	7.	8.4	9.8	11.2	12.6	14.	15.4	16.8	18.2	19.6	21.	22.4
11	3.8	5.1	6.4	7.6	8.9	10.2	11.4	12.7	14.	15.2	16.5	17.8	19.1	20.3
12	3.5	4.6	5.8	7.	8.1	9.3	10.4	11.6	12.8	13.9	15.1	16.2	17.4	18.6
14	3.	3.9	4.9	5.9	6.9	7.9	8.9	9.9	10.9	11.8	12.8	13.8	14.8	15.8
16	2.6	3.4	4.3	5.1	6.	6.8	7.7	8.6	9.4	10.3	11.1	12.	12.8	13.7
18	2.3	3.	3.8	4.5	5.3	6.	6.8	7.5	8.3	9.	9.8	10.5	11.3	12.
20	2.	2.7	3.4	4.	4.7	5.4	6.	6.7	7.4	8.	8.7	9.4	10.1	10.7
22	1.8	2.4	3.	3.6	4.2	4.8	5.4	6.	6.6	7.2	7.8	8.4	9.	9.6
24	1.6	2.2	2.7	3.3	3.8	4.3	4.9	5.4	6.	6.5	7.1	7.6	8.1	8.7
26	1.5	2.	2.5	3.	3.5	3.9	4.4	4.9	5.4	5.9	6.4	6.9	7.4	7.9
28	1.4	1.8	2.3	2.7	3.2	3.6	4.1	4.5	5.	5.4	5.9	6.3	6.8	7.2

Safe Load, uniformly distributed, for White Pine Beams, supported at both ends, in tons of 2000 lbs.

BEAMS 15" DEEP.

Depth in Ins.	4×12
	9.9
	9.0
	8.4
	7.8
	6.9
	6.3
	5.7
	4.8
	4.2
	3.3
	2.7
	2.4
	2.1

STRENGTH OF WHITE PINE STRUTS OR PILLARS. *Continued.*

Length in feet.	Dimensions of Cross-Sections in Ins. Safe load in tons of 2000 lbs.							
	5×5	5×6	5×7	5×8	5×9	5×10	5×11	5×12
8	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0
9	4.7	5.6	6.6	7.5	8.5	9.4	10.3	11.3
10	4.4	5.3	6.2	7.0	7.9	8.8	9.7	10.6
11	4.1	4.9	5.7	6.6	7.4	8.2	9.0	9.8
12	3.8	4.6	5.3	6.1	6.8	7.6	8.4	9.1
13	3.5	4.2	4.9	5.6	6.4	7.0	7.7	8.4
14	3.2	3.8	4.5	5.1	5.8	6.4	7.0	7.7
15	2.9	3.5	4.1	4.6	5.2	5.8	6.4	7.0
16	2.6	3.1	3.6	4.2	4.7	5.2	5.7	6.2
17	2.3	2.8	3.2	3.7	4.1	4.6	5.1	5.5
18	2.1	2.5	2.9	3.4	3.8	4.2	4.6	5.0
19	1.8	2.2	2.5	2.9	3.2	3.6	4.0	4.3
20	1.5	1.8	2.1	2.4	2.7	3.0	3.2	3.6

Length in feet.	Dimensions of Cross-Sections in Ins. Safe load in tons of 2000 lbs.							
	6×5	6×6	6×7	6×8	6×9	6×10	6×11	6×12
10	5.9	7.1	8.3	9.5	10.7	11.8	13.0	14.2
11	5.6	6.7	7.8	8.9	10.0	11.2	12.3	13.4
12	5.3	6.3	7.4	8.4	9.5	10.5	11.5	12.6
13	5.0	5.9	6.9	7.9	8.8	9.8	10.8	11.8
14	4.7	5.6	6.5	7.5	8.4	9.3	10.3	11.2
15	4.4	5.3	6.2	7.1	7.9	8.8	9.7	10.6
16	4.1	4.9	5.7	6.5	7.3	8.2	9.0	9.8
17	3.8	4.5	5.3	5.9	6.8	7.5	8.3	9.0
18	3.5	4.2	4.9	5.6	6.3	7.0	7.7	8.4
19	3.2	3.8	4.4	5.1	5.7	6.4	7.0	7.6
20	3.0	3.5	4.1	4.7	5.2	5.8	6.4	7.0
21	2.6	3.1	3.6	4.1	4.7	5.2	5.7	6.2
22	2.3	2.8	3.3	3.7	4.2	4.7	5.2	5.6

STRENGTH OF WHITE PINE STRUTS OR PILLARS. *Continued.*

Length in feet.	Dimensions of Cross-Sections in Ins. Safe load in tons of 2000 lbs.							
	7×5	7×6	7×7	7×8	7×9	7×10	7×11	7×12
10	7.7	9.2	10.8	12.3	13.9	15.4	16.9	18.4
11	7.2	8.6	10.1	11.5	13.0	14.4	15.8	17.2
12	6.8	8.0	9.5	10.9	12.2	13.6	15.0	16.0
13	6.5	7.7	9.0	10.3	11.6	13.0	14.2	15.4
14	6.2	7.4	8.6	9.8	11.1	12.4	13.5	14.8
15	5.9	7.0	8.2	9.4	10.5	11.8	12.9	14.0
16	5.6	6.7	7.8	8.9	10.0	11.2	12.2	13.4
17	5.3	6.4	7.4	8.5	9.5	10.6	11.7	12.8
18	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0
19	4.7	.6	6.6	7.5	8.5	9.4	10.3	11.2
20	4.4	.2	6.1	7.0	7.8	8.8	9.6	10.4
21	4.1	4.9	5.7	6.5	7.3	8.2	8.9	9.8
22	3.8	4.6	5.3	6.1	6.8	7.6	8.4	9.2

Length in feet.	Dimensions of Cross-Sections in Ins. Safe load in tons of 2000 lbs.							
	8×5	8×6	8×7	8×8	8×9	8×10	8×11	8×12
10	9.6	11.5	13.4	15.3	17.2	19.2	21.0	23.0
11	9.0	10.8	12.6	14.4	16.2	18.0	19.8	21.6
12	8.5	10.2	11.9	13.6	15.3	17.0	18.7	20.4
13	8.1	9.7	11.3	12.9	14.5	16.2	17.7	19.4
14	7.7	9.2	10.8	12.3	13.9	15.4	16.9	18.4
15	7.3	8.8	10.2	11.7	13.1	14.6	16.1	17.6
16	7.0	8.4	9.8	11.2	12.6	14.0	15.4	16.8
17	6.7	8.0	9.4	10.7	12.1	13.4	14.7	16.0
18	6.4	7.7	9.0	10.2	11.5	12.8	14.1	15.4
19	6.1	7.4	8.5	9.7	10.9	12.2	13.3	14.8
20	5.8	7.0	8.1	9.3	10.4	11.6	12.8	14.0
21	5.5	6.6	7.7	8.8	9.9	11.0	12.1	13.2
22	5.3	6.3	7.4	8.4	9.5	10.6	11.6	12.6

STRENGTH OF WHITE PINE STRUTS OR PILLARS. *Continued.*

Length in feet.	Dimensions of Cross-Sections in Ins. Safe load in tons of 2000 lbs.							
	9×5	9×6	9×7	9×8	9×9	9×10	9×11	9×12
10	11.9	14.3	16.7	19.2	21.5	23.8	26.3	28.6
11	11.0	13.1	15.3	17.6	19.7	22.0	24.1	26.2
12	10.3	12.4	14.4	16.4	18.5	20.6	22.7	24.8
13	9.8	11.7	13.7	15.6	17.5	19.6	21.5	23.4
14	9.3	11.3	13.0	14.8	16.7	18.6	20.5	22.6
15	8.9	10.7	12.5	14.2	16.0	17.8	19.6	21.4
16	8.5	10.2	11.9	13.6	15.3	17.0	18.7	20.4
17	8.2	9.8	11.4	13.0	14.7	16.4	17.9	19.8
18	7.9	9.5	11.1	12.6	14.2	15.8	17.4	19.0
19	7.6	9.1	10.7	12.0	13.7	15.2	16.7	18.2
20	7.3	8.7	10.2	11.6	13.1	14.6	16.0	19.4
21	7.0	8.4	9.8	11.2	12.6	14.0	15.4	17.8
22	6.8	8.1	9.5	10.8	12.1	13.6	14.9	16.2

Length in feet.	Dimensions of Cross-Sections in Ins. Safe load in tons of 2000 lbs.							
	10×6	10×7	10×8	10×9	10×10	10×11	10×12	
10	17.5	20.4	23.4	26.3	29.2	32.1	35.0	
11	16.2	18.9	21.6	24.3	27.0	29.7	32.4	
12	15.1	17.6	20.0	22.6	25.1	27.6	30.2	
13	14.2	16.6	19.0	21.3	23.7	26.1	28.4	
14	13.5	15.8	18.0	20.3	22.5	24.8	27.0	
15	12.9	15.1	17.2	19.4	21.5	23.7	25.8	
16	12.3	14.4	16.4	18.5	20.5	22.6	24.6	
17	11.8	13.7	15.6	17.6	19.6	21.6	23.6	
18	11.3	13.1	15.2	17.0	18.9	20.8	22.6	
19	10.9	12.7	14.6	16.4	18.2	20.0	21.8	
20	10.5	12.2	14.0	15.8	17.5	19.3	21.0	
21	10.0	11.7	13.4	15.0	16.7	18.4	20.0	
22	9.6	11.2	12.8	14.4	16.0	17.6	19.2	

STRENGTH OF WHITE PINE STRUTS OR PILLARS. *Continued.*

Length in feet.	Dimensions of Cross-Sections in Ins. Safe load in tons of 2000 lbs.							
	11×6	11×7	11×8	11×9	11×10	11×11	11×12	
12	18.0	21.0	24.0	27.0	30.0	33.0	36.0	
13	16.9	19.7	22.6	25.4	28.2	31.0	33.8	
14	16.0	18.7	21.6	24.0	26.8	29.4	32.0	
15	15.4	17.9	20.4	23.0	25.6	28.1	30.8	
16	14.7	17.2	19.6	22.0	24.6	26.9	29.4	
17	14.2	16.5	18.8	21.2	23.6	25.9	28.4	
18	13.5	15.8	18.0	20.3	22.6	24.9	27.0	
19	13.0	15.2	17.4	19.5	21.8	23.9	26.0	
20	12.5	14.6	16.8	18.8	21.0	23.0	25.0	
21	12.0	14.0	16.0	18.0	20.0	22.0	24.0	
22	11.6	13.5	15.4	17.4	19.4	21.2	23.2	
23	11.2	13.0	14.8	16.7	18.6	20.5	22.4	
24	10.8	12.6	14.4	16.2	18.0	19.8	21.6	

Length in feet.	Dimensions of Cross-Sections in Ins. Safe load in tons of 2000 lbs.							
	12×6	12×7	12×8	12×9	12×10	12×11	12×12	
12	21.0	24.5	28.0	31.5	35.0	38.5	42.0	
13	19.9	23.2	26.4	29.8	33.2	36.4	39.7	
14	18.8	21.9	25.0	28.1	31.4	34.4	37.6	
15	17.9	20.9	23.8	26.8	29.8	32.8	35.8	
16	17.1	20.0	22.8	25.7	28.6	31.4	34.2	
17	16.4	19.1	21.8	24.6	27.4	30.0	32.7	
18	15.7	18.3	21.0	23.6	26.2	28.8	31.4	
19	15.1	17.6	20.2	22.7	25.2	27.7	30.2	
20	14.6	17.0	19.4	21.9	24.4	26.7	29.2	
21	14.1	16.5	18.8	21.2	23.6	25.8	28.2	
22	13.6	15.9	18.2	20.5	22.8	25.0	27.2	
23	13.1	15.3	17.4	19.6	21.8	24.0	26.2	
24	12.6	14.7	16.8	18.9	21.0	23.1	25.2	

TABLE OF BOARD MEASURE.

EXPLANATION.—The length of the board is given, in feet, in the left-hand column; the width is given, in inches, in the upper row of figures; and the contents are given under the width, and opposite the length. Thus, the contents of a board 13 feet long and 7 inches wide will be found under 7, and opposite 13, and is 7 feet 7 inches.

Length, in feet.	WIDTH, IN INCHES.																	
	6		7		8		9		10		11		12	13		14		
	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	feet.	ft.	in.	ft.	in.	
1	0	6	0	7	0	8	0	9	0	10	0	11	1	1	1	1	2	
2	1	0	1	2	1	4	1	6	1	8	1	10	2	2	2	2	4	
3	1	6	1	9	2	0	2	3	2	6	2	9	3	3	3	3	6	
4	2	0	2	4	2	8	3	0	3	4	3	8	4	4	4	4	8	
5	2	6	2	11	3	4	3	9	4	2	4	7	5	5	5	5	10	
6	3	0	3	6	4	0	4	6	5	0	5	6	6	6	6	7	0	
7	3	6	4	1	4	8	5	3	5	10	6	5	7	7	7	8	2	
8	4	0	4	8	5	4	6	0	6	8	7	4	8	8	8	9	4	
9	4	6	5	3	6	0	6	9	7	6	8	3	9	9	9	10	6	
10	5	0	5	10	6	8	7	6	8	4	9	2	10	10	10	11	8	
11	5	6	6	5	7	4	8	3	9	2	10	1	11	11	11	12	10	
12	6	0	7	0	8	0	9	0	10	0	11	0	12	13	0	14	0	
13	6	6	7	7	8	8	9	9	10	10	11	11	13	14	1	15	2	
14	7	0	8	2	9	4	10	6	11	8	12	10	14	15	2	16	4	
15	7	6	8	9	10	0	11	3	12	6	13	9	15	16	3	17	6	
16	8	0	9	4	10	8	12	0	13	4	14	8	16	17	4	18	8	
17	8	6	9	11	11	4	12	9	14	2	15	7	17	18	5	19	10	
18	9	0	10	6	12	0	13	6	15	0	16	6	18	19	6	21	0	
19	9	6	11	1	12	8	14	3	15	10	17	5	19	20	7	22	2	
20	10	0	11	8	13	4	15	0	16	8	18	4	20	21	8	23	4	
21	10	6	12	3	14	0	15	9	17	6	19	3	21	22	9	24	6	
22	11	0	12	10	14	8	16	6	18	4	20	2	22	23	10	25	8	
23	11	6	13	5	15	4	17	3	19	2	21	1	23	24	11	26	10	
24	12	0	14	0	16	0	18	0	20	0	22	0	24	26	0	28	0	
25	12	6	14	7	16	8	18	9	20	10	22	11	25	27	1	29	2	
26	13	0	15	2	17	4	19	6	21	8	23	10	26	28	2	30	4	
27	13	6	15	9	18	0	20	3	22	6	24	9	27	29	3	31	6	
28	14	0	16	4	18	8	21	0	23	4	25	8	28	30	4	32	8	
29	14	6	16	11	19	4	21	9	24	2	26	7	29	31	5	33	10	
30	15	0	17	6	20	0	22	6	25	0	27	6	30	32	6	35	0	
31	15	6	18	1	20	8	23	3	25	10	28	5	31	33	7	36	2	

TABLE OF BOARD MEASURE—*(Continued.)*

Length, in feet.	Width, in Inches.																	
	15		16		17		18		19		20		21		22		23	
	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.
1	1	3	1	4	1	5	1	6	1	7	1	8	1	9	1	10	1	11
2	2	6	2	8	2	10	3	0	3	2	3	4	3	6	3	8	3	10
3	3	9	4	0	4	3	4	6	4	9	5	0	5	3	5	6	5	9
4	5	0	5	4	5	8	6	0	6	4	6	8	7	0	7	4	7	8
5	6	3	6	8	7	1	7	6	7	11	8	4	8	9	9	2	9	7
6	7	6	8	0	8	6	9	0	9	6	10	0	10	6	11	0	11	6
7	8	9	9	4	9	11	10	6	11	1	11	8	12	3	12	10	13	5
8	10	0	10	8	11	4	12	0	12	8	13	4	14	0	14	8	15	4
9	11	3	12	0	12	9	13	6	14	3	15	0	15	9	16	6	17	3
10	12	6	13	4	14	2	15	0	15	10	16	8	17	6	18	4	19	2
11	13	9	14	8	15	7	16	6	17	5	18	4	19	3	20	2	21	1
12	15	0	16	0	17	0	18	0	19	0	20	0	21	0	22	0	23	0
13	16	3	17	4	18	5	19	6	20	7	21	8	22	9	23	10	24	11
14	17	6	18	8	19	10	21	0	22	2	23	4	24	6	25	8	26	10
15	18	9	20	0	21	3	22	6	23	9	25	0	26	3	27	6	28	9
16	20	0	21	4	22	8	24	0	25	4	26	8	28	0	29	4	30	8
17	21	3	22	8	24	1	25	6	26	11	28	4	29	9	31	2	32	7
18	22	6	24	0	25	6	27	0	28	6	30	0	31	6	33	0	34	6
19	23	9	25	4	26	11	28	6	30	1	31	8	33	3	34	10	36	5
20	25	0	26	8	28	4	30	0	31	8	33	4	35	0	36	8	38	4
21	26	3	28	0	29	9	31	6	33	3	35	0	36	9	38	6	40	3
22	27	6	29	4	31	2	33	0	34	10	36	8	38	6	40	4	42	2
23	28	9	30	8	32	7	34	6	36	5	38	4	40	3	42	2	44	1
24	30	0	32	0	34	0	36	0	38	0	40	0	42	0	44	0	46	0
25	31	3	33	4	35	5	37	6	39	7	41	8	43	9	45	10	47	11
26	32	6	34	8	36	10	39	0	41	2	43	4	45	6	47	8	49	10
27	33	9	36	0	38	3	40	6	42	9	45	0	47	3	49	6	51	9
28	35	0	37	4	39	8	42	0	44	4	46	8	49	0	51	4	53	8
29	36	3	38	8	41	1	43	6	45	11	49	4	50	9	53	2	55	7
30	37	6	40	0	42	6	45	0	47	6	50	0	52	6	55	0	57	6
31	38	9	41	4	43	11	46	6	49	1	51	8	54	3	56	10	59	5

FLOORS FOR DANCING must be springy and elastic ; joists may be 18 inches apart or even more ; the boards should be in narrow widths, of pine, well beeswaxed, and should follow as much as possible the round of the room. Allow 1 cwt. per foot superficial as safe load.

RULE FOR COMPUTING THE NUMBER OF SLATES IN A SQUARE.

Subtract three inches, or the amount of head-cover, from the length of the slate, multiply the remainder by the width, and divide by two. This will give the number of square inches covered per slate; divide 14,400 (the number of square inches in a square) by the number so found, and the result will be the number of slates required.

The following table gives the number of slates per square for the usual sizes, allowing three inches for head-cover :—

NUMBER OF SLATES PER SQUARE.

Size, in inches.	Pieces per square.	Size, in inches.	Pieces per square.	Size, in inches.	Pieces per square.
6 x 12	533	8 x 16	277	12 x 20	141
7 x 12	457	9 x 16	246	14 x 20	121
8 x 12	400	10 x 16	221	11 x 22	137
9 x 12	355	9 x 18	213	12 x 22	126
7 x 14	374	10 x 18	192	14 x 22	108
8 x 14	327	12 x 18	160	12 x 24	118
9 x 14	291	10 x 20	169	14 x 24	94
10 x 14	261	11 x 20	154	16 x 24	86

The weight of slate per cubic foot is about 174 pounds, or, per square foot of various thicknesses, as follows :—

Thickness, in inches..	1-8	3-16	1-4	3-8	1-2
Weight, in pounds....	1.81	2.71	3.62	5.43	7.25

The weight of slating laid per square foot of surface covered will, of course, depend on the size used. The weight of 10 by 18 slate, three-sixteenths of an inch thick, for example, per square foot of roof, would be 5.86 pounds.

An experienced roofer will lay, on an average, two squares of slate in ten hours.

Ordinary roofing-paper weighs about fifteen pounds per square, and averages about fifty pounds in a roll.

At the present time the additional cost of laying slate in elastic cement varies from thirteen to fifteen per cent.

SHINGLES.

The average width of a shingle is four inches : hence, when shingles are laid four inches to the weather, each shingle averages sixteen square inches, and 900 are required for a square of roofing.

If 4½ inches to the weather, 800 will cover a square.
5 " " " 720 " "
5½ " " " 655 " "
6 " " " 600 " "

This is for common gable-roofs. In hip-roofs, where the shingles are cut more or less to fit the roof, add five per cent. to above figures.

A carpenter will carry up and lay on the roof from fifteen hundred to two thousand shingles per day, or two squares to two squares and a half of plain gable-roofing.

One thousand shingles laid four inches to the weather will require five pounds of shingle-nails to fasten them on. Six pounds of fourpenny nails will lay one thousand split pine shingles.

CRUSHING AND TENSILE STRENGTH, IN LBS., PER SQ. INCH OF NATURAL AND ARTIFICIAL STONES.

DESCRIPTION.	Weight per Cubic ft., in lbs.	Crushing Force. Lbs. per sq. inch.
Aberdeen Blue Granite	164	8,400 to 10,914
Quincy Granite	166	15,300
Freestone, Belleville	.....	3,522
Freestone, Caen	.....	1,088
Freestone, Connecticut	.....	3,319
Sandstone, Acquia Creek, used for Capitol Washington	.....	5,340
Limestone, Magnesian, Grafton, Ill	.....	17,000
Marble, Hastings, N. Y	.....	18,941
Marble, Italian	.....	12,624
Marbie, Stockbridge, City Hall, N. Y	.....	10,382
Marble, Statuary	.....	3,216
Marble, Veined	165	9,681
Slate	.....	9,300
Brick, Red	135.5	808
Brick, Pale Red	130.3	562
Brick, Common	.....	800 to 4,000
Brick, Machine Pressed	.....	6,222 to 14,216
Brick, Stock	.....	2,177
Brick-work, set in Cement, bricks not very hard	.....	521
Brick, Masonry, Common	.....	500 to 800
Cement, Portland	.....	1,000 to 8,300
Cement, Portland, Cement 1, Sand 1	.....	1,280
Cement, Roman	.....	342
Mortar	.....	120 to 240
Crown Glass	.....	31,000
		TENSION.
Portland Cement	.....	427 to 711
Portland Cement, with Sand	.....	92 to 284
Glass, Plate	.....	9,420
Mortar	.....	50
Plaster of Paris	.....	72
Slate	.....	11,000

PROPERTIES OF TIMBER.

DESCRIPTION.	Weight per Cubic Foot in lbs.	Weight per foot B. M. in lbs., average.	Tensile strength per sq. in., in lbs.	Crushing strength per sq. inch, in lbs.	Relative strength for cross breaking White Pine=100.	Shearing strength with the grain, lbs.. per sq. inch.	Pressure in lbs. per sq. inch, to indent 1-20'
Ash.....	43 to 55.8	4.1	11,000 to 17,207	4,400 to 9,363	120 to 180	458 to 700	1,800 to 1,850
Beech.....	43 to 53.4	3.9	11,500 to 18,000	5,800 to 9,363	100 to 104	.....	.....
Cedar.....	50 to 56.8	4.5	10,300 to 11,400	5,600 to 6,000	55 to 63	.....	.....
Cherry.....	.....	.....	.....	.....	130	.....	.....
Chestnut	33	2.75	10,500	5,350 to 5,600	96 to 123	.....	.....
Elm.....	34 to 36.7	2.9	13,400 to 13,489	6,831 to 10,331	96	.....	.....
Hemlock.....	.....	.....	8,700	5,700	88 to 95	.....	.....
Hickory.....	.....	.....	12,800 to 18,000	8,925	150 to 210	.....	.....
Locust..	44	3.7	20.500 to 24,800	9,113 to 11,700	132 to 227	.....	.....
Maple.....	49	4.1	10,500 to 10,584	8,150	122 to 220	367 to 647	1,700 to 1,900
Oak, White.....	45 to 54.5	4.1	10,253 to 19,500	4,684 to 9,509	130 to 177	752 to 966	2,300 to 3,550
Oak, Live	70	5.8	.....	6,850	155 to 189	.....	.....
Pine, White.....	30	2.5	10,600 to 12,000	5,000 to 6,650	100	225 to 423	875 to 1,160
Pine, Yellow.....	28.8 to 33	2.6	12,600 to 19,200	5,400 to 9,500	98 to 170	286 to 415	1,900
Spruce.....	.....	.....	10,000 to 19,500	5,050 to 7,850	86 to 110	253 to 374	875 to 1,025
Walnut, Black.....	42	3.5	9,286 to 16,000	7,500	.....	.....	2,200 to 2,600

AVOIRDUPOIS WEIGHT.

The standard avoirdupois pound is the weight of 27.7015 cubic inches of distilled water, weighed in the air, at 39.83 degrees Fahr., barometer at thirty inches.

Ounces.		Pounds.		Quarters.		Cwts.		Ton.
1.	=	.0625	=	.00223	=	.000558	=	.000028
16.		1.		.0357		.00893		.000447
448.		28.		1.		.25		.0125
1792.		112.		4.		1.		.05
35840.		2240.		80.		20.		1.

A drachm = 27.343 grains.
A stone = 14 pounds.
A quintal = 100 kilogrammes.

7000 grains = 1 avoir. pound = 1.21528 troy pounds.
5760 grains = 1 troy pound = .82285 avoir. pound.

Kilos p. sq. centim. × 14.22 = pounds p. sq. inch.
Pounds p. sq. inch × .0703 = Kilos p. sq. centim.

FRENCH WEIGHTS.

EQUIVALENT TO AVOIRDUPOIS

	Grains.	Ounces.	Pounds.
Milligramme	.015433		
Centigramme	.154331	.000352	.000022
Decigramme	1.54331	.003527	.000220
Gramme	15.4331	.035275	.002204
Decogramme	154.331	.352758	.022047
Hectogramme	1543.31	3.52758	.220473
Kilogramme	15433.1	35.2758	2.20473
Myriogramme		352.758	22.0473
Quintal		3527.58	220.473
Millier or Tonne		35275.8	2204.73

AVOIRDUPOIS WEIGHT.

(Canadian.)

27⅓ grains	= 1 drachm = 27.34375 grains.
16 drachms	= 1 ounce = 437.5 grains.
16 ounces.....	= 1 pound = 7000 grains.
25 pounds	= 1 quarter.
4 quarters.....	= 1 hundredweight.
20 hundredweight....	= 1 ton or 2000 lbs.

CIRCLES.

The diameter of a circle is 0.31831 times the circumference.

The circumference is .31416 times the diameter.

The diameter multiplied by 0.8862 equals the side of a square of the same area.

The inside of a square + 1.128 equals the diameter of a circle of the same area.

WEIGHT OF VARIOUS LOADS ON ROOFS.

100 FT. SPAN OR LESS.

Covered with corrugated iron :—			
Laid on purlins.....	= 8	lbs.	per sq. ft.
" board.....	=11	"	"
Covered with slate :—			
Laid on purlins.....	=13	"	"
" boards.....	=16	"	"
Covered with shingles or laths.....	=10	"	"
If plastered below .....add	10	"	"
For iron construction .....add	4	"	"
For snow and vertical component of wind force.....add	30	"	"

SAFE HEIGHT OF PILLARS OF STONE OR BRICK.

No pillar or support of brick or stone should, as a rule, exceed in height 12 times its least thickness at the base. When longer there is a considerable falling off in strength. A height of 24 times the thickness reduces the strength from 10 to 7. When increased to 30 times the strength is reduced one-half, and when increased to 40 times the strength is reduced to one-third.

TEST OF WHITE PINE.

The strength of white pine varies widely in different samples. Some careful tests made recently by J. W. Woodman, Building Inspector, Minneapolis, gave the following results, all but two samples being taken from different boards and from different trees. Thirteen pieces 1″ × 1″, 12″ between bearings and loaded at centre, broke as follows :

1. 420 lbs.	5. 610 lbs.	9. 295 lbs.
2. 580 "	6. 530 "	10. 540 "
3. 430 "	7. 395 "	11. 270 "
4. 465 "	8. 280 "	12. 420 "
	13. 210 "	

SQUARE OR SURFACE MEASURE.

	Inches.	Feet.	Yards.	Poles.	Chains.	Roods.
Square foot	144	1				
Square yard	1,296	9	1			
Rod, pole or perch	39,204	272¼	30¼	1		
Square chain	627,264	4,356	484	16	1	
Rood	1,568,160	10,890	1,210	40	2½	1
Acre	6,272,640	43,560	4,840	160	10	4

1 square mile = 640 acres = 2560 roods = 6400 chains
= 102,400 rods (poles or perches)
= 3,097'600 square yards.

1 square acre = 209 feet (nearly) or 12¾ rods on each side.

CUBIC OR SOLID MEASURE.

1728	cubic inches		1 cubic foot.
27	cubic feet		1 cubic yard.
40	"	of rough timber	1 ton or load.
50	"	of hewn timber	
42	"	of timber	1 shipping ton.
108	"		1 stack of wood.
128	"	4 × 4 × 8	1 cord of wood.
40	"	merchandise	1 ton shipping.

MEASURES OF LENGTH.

	Inches.	Feet.	Yards.	Poles.	Chains.	Furlongs.
Foot	12	1				
Yard	36	3	1			
Rod, pole or perch	198	16½	5½	1		
Chain	792	66	22	4	1	
Furlong	7,920	660	220	40	10	1
Mile	63,360	5,280	1,760	320	89	8
Mile, geographical		6,082.66				

PARTICULAR MEASURES OF LENGTH.

1 Hand = 4 inches. 1 Link = 7.92 inches. 1 Cubit = 18 inches.
1 Military pace = 2 feet 6 inches. 1 Pace geometrical = 5 feet.
1 Fathom = 6 feet. 1 Cable's length = 120 fathoms.
1 League = 3 miles. 1 Admiralty knot = 6080 feet.
1 Degree = 69⅛ miles = 60 nautical knots or geometrical miles.

WEIGHT OF WATER.

1 cubic foot of water	= 64.425 lbs.
1 cubic inch of water	= .03612 lbs.
1 gallon	= 10 lbs.
1 cwt. = 1.8 cubic feet	= 11.2 gallons.
1 ton = 35.9 cubic feet	= 224 gallons.
1 cubic foot of sea water	= 64.11 lbs.

CONVERTING SUPERFICIAL MEASURE INTO BOARD MEASURE FOR FLOORS.

SIZE.	10 inch centres	12 inch centres	14 inch centres	16 inch centres	18 inch entres	20 inch centres	22 inch centres	24 inch centres	26 inch centres	28 inch centres	30 inch centres
2 x 2	0.400	0.333	0.286	0.250	0.222	0.200	0.182	0.167	0.155	0.143	0.133
2 x 4	0.800	0.667	0.571	0.500	0.444	0.400	0.364	0.333	0.309	0.286	0.267
2 x 6	1.200	1.000	0.857	0.750	0.667	0.600	0.545	0.500	0.464	0.429	0.400
2 x 8	1.600	1.333	1.143	1.000	0.889	0.800	0.727	0.667	0.618	0.572	0.533
2 x 10	2.000	1.667	1.429	1.250	1.111	1.000	0.909	0.833	0.773	0.714	0.667
2 x 12	2.400	2.000	1.714	1.500	1.333	1.200	1.091	1.000	0.928	0.857	0.800
2 x 14	2.800	2.333	2.000	1.750	1.556	1.400	1.273	1.167	1.082	1.000	0.933
2 x 16	3.200	2.667	2.286	2.000	1.778	1.600	1.455	1.333	1.237	1.143	1.067
2 x 18	3.600	3.000	2.571	2.250	2.000	1.800	1.636	1.500	1.392	1.286	1.200
2 x 20	4.000	3.333	2.857	2.500	2.222	2.000	1.818	1.667	1.546	1.429	1.333
2 x 22	4.400	3.667	3.143	2.750	2.444	2.200	2.000	1.883	1.701	1.572	1.467
2 x 24	4.800	4.000	3.429	3.000	2.667	2.400	2.182	2.000	1.855	1.714	1.600
3 x 2	0.600	0.500	0.429	0.375	0.333	0.300	0.273	0.250	0.232	0.214	0.200
3 x 4	1.200	1.000	0.857	0.750	0.667	0.600	0.545	0.500	0.464	0.429	0.400
3 x 6	1.800	1.500	1.286	1.125	1.000	0.900	0.818	0.750	0.696	0.643	0.600
3 x 8	2.400	2.000	1.714	1.500	1.333	1.200	1.091	1.000	0.928	0.857	0.800
3 x 10	3.000	2.500	2.143	1.875	1.667	1.500	1.363	1.250	1.160	1.071	1.000
3 x 12	3.600	3.000	2.571	2.250	2.000	1.800	1.636	1.500	1.392	1.286	1.200
3 x 14	4.200	3.500	3.000	2.625	2.333	2.100	1.909	1.750	1.623	1.500	1.400
3 x 16	4.800	4.000	3.429	3.000	2.667	2.400	2.182	2.000	1.855	1.714	1.600
3 x 18	5.400	4.500	3.857	3.375	3.000	2.700	2.455	2.250	2.087	1.929	1.800
3 x 20	6.000	5.000	4.286	3.750	3.333	3.000	2.727	2.500	2.319	2.143	2.000
3 x 22	6.600	5.500	4.714	4.125	3.667	3.300	3.000	2.750	2.551	2.357	2.200
3 x 24	7.200	6.000	5.143	4.500	4.000	3.600	3.273	3.000	2.683	2.571	2.400

STRENGTH OF SOLID TIMBER AND PLANK FLOORS,

i. e., FLOORS OF LARGE BEAMS AT 8 FT. CENTRES COVERED WITH PLANKS.

(From Kidder. By C. J. H. Woodbury.)

WEIGHT PER SQ. FT. OF FLOOR.				DIMENSIONS OF BEAMS.			Thickness of floor plank in inches.
Superficial load.	Weight of beam in lbs.	Weight of floor plank.	Total.	Depth in inches.	Breadth in inches.	Span in feet.	
50	3.00	6.07	59.07	12	6	20.95	2.43
	4.08		60.15	14	7	26.16	
	5.33		61.40	16	8	31.63	
75	3.00	7.40	85.40	12	6	17.42	2.96
	4.08		86.48	14	7	21.82	
	5.33		87.73	16	8	26.46	
100	3.00	8.55	111.55	12	6	15.25	3.42
	4.08		111.63	14	7	19.12	
	5.33		113.88	16	8	23.23	
125	3.00	9.55	137.55	12	6	13.73	3.82
	4.08		138.63	14	7	17.23	
	5.33		139.88	16	8	20.96	
150	3.00	10.45	163.45	12	6	12.59	4.18
	4.08		164.53	14	7	15.82	
	5.33		165.78	16	8	19.25	
175	3.00	11.26	189.26	12	6	11.71	4.51
	4.08		190.34	14	7	14.70	
	5.33		191.59	16	8	17.91	
200	3.00	12.05	215.05	12	6	10.98	4.82
	4.08		216.13	14	7	13.80	
	5.33		217.38	16	8	16.81	
225	3.00	12.75	240.75	12	6	10.38	5.11
	4.08		241.83	14	7	13.06	
	5.33		243.08	16	8	15.90	
250	3.00	13.45	266.45	12	6	9.86	5.38
	4.08		267.53	14	7	12.40	
	5.33		268.78	16	8	15.08	
275	3.00	13.55	291.55	12	6	9.43	5.62
	4.08		292.63	14	7	11.86	
	5.33		293.88	16	8	14.46	
300	3.00	14.72	317.72	12	6	9.03	5.89
	4.08		318.80	14	7	11.36	
	5.33		320.05	16	8	13.85	

SOLID BUILT BEAMS.

In the construction of "built" beams for wide spans concerning the keys used to prevent sliding of the timbers, Tredgold says, "the breadth of the key should be twice its depth," and the sum of the depths should be equal to *once and a third* the total depth of the beam." The bolts and keys may with great advantage be placed at an angle of 45 degrees with the axis of the beam, those on the left half sloping one way, those on the right, the reverse. Keys are made in two pieces with a wedge between left projecting when first driven in tight so as to admit of tightening up in the event of shrinkage. When the depth of the beam is restricted by circumstances so that keys cannot be used, the beams should be notched on the sides that touch, the notches or indentations corresponding exactly. The two timbers are then held together by means of straps or bolts, but this method does not admit of wedges by which the beams may be tightened up. Beams of several thicknesses should "break joint."

DRY ROT.

To prevent dry rot, good seasoning of the timber before using and good ventilation for it when in place in a building are essential. Charring and coal tar are recommended. To cure dry rot, a solution of corrosive sublimate in water (an ounce to a gallon used hot) or a solution of sulphate of copper (half a lb. to a gallon of water used hot) are good washes. Where dry rot results from want of ventilation no cure will be effective short of supplying the necessary air. The best cure is to substitute new timbers for rotten ones, clear away every particle of fungus from adjoining walls and timbers, afterwards apply some of the washes given for the preservation of timber. Coal tar will effect the same purpose, or a weak solution of vitriolic acid with water will generally stop the rot if it has not gone too far, and pyroligneous acid is recommended to prevent the spread of dry rot. When linoleum or kamptulicon are fastened down to wood floors dry rot is almost inevitable; free ventilation under the boards will prevent it but that is generally impracticable, or when practicable it is difficult to obtain sufficient ventilation.

STRENGTH OF TIMBER.

The following figures give the transverse strengths of several woods in common use as compared with cast iron. The test piece in each case being a bar 1 in. square in cross section, one foot long between supports:

Materials.	Breaking weight in pounds.	Weight carried with safety.
Hickory (seasoned).....	270	90
White oak.....	240	80
Ash (seasoned).....	175	55
Chesnut "	170	54
Yellow pine "	150	50
White pine "	135	45
Cast iron.....	5781	1927

TABLE OF LUMBER MEASURE.

A table of lumber measure is convenient to have when making bills of quantities. In the table here given the length of the timber is set off in the upper line ranging from 12 to 30 ft., and the size is indicated in the left hand column. Thus a stick 6x6 in. and 26 ft. long contains 78 ft., board measure.

Size in inches	12	14	16	18	20	22	24	26	28	30
2x3	6	7	8	9	10	11	12	13	14	15
2x4	8	9	11	12	13	15	16	17	19	20
2x6	12	14	16	18	20	22	24	26	28	30
2x8	16	19	21	24	27	29	32	35	37	40
2x10	20	23	27	30	33	37	40	43	47	50
2x12	24	28	32	36	40	44	48	52	56	60
2x14	28	33	37	42	47	51	56	61	65	70
3x4	12	14	16	18	20	22	24	26	28	30
3x6	18	21	24	27	30	33	36	39	42	45
3x8	24	28	32	36	40	44	48	52	56	60
3x10	30	35	40	45	50	55	60	65	70	75
3x12	36	42	48	54	60	66	72	78	84	90
3x14	42	49	56	63	70	77	84	91	98	105
4x4	16	19	21	24	27	29	32	35	37	40
4x6	24	28	32	36	40	44	48	52	56	60
4x8	32	37	43	48	53	59	64	69	75	80
4x10	40	47	53	60	67	73	80	87	93	100
4x12	48	56	64	72	80	88	96	104	112	120
6x6	36	42	48	54	60	66	72	78	84	90
6x8	48	56	64	72	80	88	96	104	112	120
6x10	60	70	80	90	100	110	120	130	140	150
6x12	72	84	96	108	120	132	144	156	168	180
8x8	64	75	85	96	107	117	128	139	149	160
8x10	80	93	107	120	133	147	160	173	187	200
8x13	96	112	128	144	160	176	192	208	224	240
10x10	100	117	133	150	167	183	200	217	233	250
10x12	120	140	160	180	200	220	240	260	280	300
12x12	144	168	192	216	240	264	288	312	336	360
12x14	168	196	224	252	280	308	336	364	392	420
14x14	196	229	261	294	327	359	392	425	457	490

STRENGTH OF MATERIALS.

Beams decrease in strength much faster than the length is increased; for instance, if a beam of any given size 20 ft. long will sustain a load of 100 lbs. per foot, a beam of the same size 40 ft. long will only sustain 25 lbs. per foot, and that with much more deflection, while the same beam cut down to 10 ft. long would carry 400 lbs. to each foot in length.

With posts the ratio of strengths to their lengths differs somewhat with different proportions, but roughly speaking, posts of sizes in common use diminish in strength as they increase in length in a ratio of about ⅓ to 2, that is, if a post of a given size and 10 ft. long is capable of supporting 12 tons, one of the same material and size but 20 ft. long will support but 4 tons.

The comparative strength of rods sustaining loads by suspension is not materially affected by their length. A few examples are given as a basis of calculations.

A mill has to be constructed 50 ft. wide of three stories each 10 ft. high, centre posts and beams 8 ft. between centres, making beams 25 feet long from posts to walls. To carry safely the ordinary load of 200 lbs. per square foot the beam should be of Southern pine 12x16 with posts in lowest stories, round, 11 inches diameter, or square, 10 inches diameter; second story posts 9x9 or 10 inches diameter, and in the third story 8x8 or 9 inches diameter to carry roof. A 15 inch I beam 150 lbs. per yard 25 ft. long would be about the same strength as a 12x16 beam.

A 6-inch round wrought iron column of ⅝-inch shell or a 6-inch cast iron column free from flaws, with ½-inch shell would be the same strength as the 10x10 posts, cast iron being stronger in columns than wrought iron, except where they are very slender.

Iron will not resist heat so long as wood, wrought iron becoming soft and pliable and cast iron cracking with heat and water.

If a brick pier is to carry a load of 10x10 posts it should be well built, 2 ft. square, or at least 20x24 inches, and it will resist the action of heat longer than any other of the materials mentioned.

A 1¾ inch rod will safely support by suspension the same amount of floor surface of a single floor as is carried by one of these posts.

It the mill is to be used as a warehouse, filled with barrels of flour, the weight should be calculated for 400 lbs. to the square foot, and it would require another row of posts between the centre posts and the wall, thus making the beams about 12 feet between the bearings; the beams remaining the same size and the posts increased a little, the wood about 1 inch, the iron ½ inch.

BEAMS AND GIRDERS.

It is often necessary to decide quickly what sort of beam or girder shall be used across any wide span. To ascertain the required strength estimates must be made of the following: the amount of walling, brick or stone, which the beam will have to carry, the beam being able to support twice as much when the load is evenly distributed along its length than when concentrated in the centre. When there is a central pier between windows, the heaviest part will be in the centre and must be allowed for. Allow 1 cwt. per cubic foot as weight of brick or stone, the share of flooring or roof that the beam will carry either resting on itself or in the wall above. Half the entire weight upon any such floor will be carried as a

distributed load upon the beam. Hurst's Handbook gives the following weights per square foot which floors should be calculated to sustain, including the floor itself:

Ordinary dwelling house floors	1¼ cwt.
Public buildings, etc	1½ cwt.
Warehouses, factories, etc	½ cwt. to 4 cwt.

These are high, but they allow for part being moving weights. For the roofing 40 lbs. per square foot may ordinarily be allowed, which includes timbers, covering, etc.

WEIGHT OF CROWDS.

Authorities differ to an extraordinary degree as to the weight of crowds, some giving as a correct weight per square foot as much as four times that given by others. The lowest calculation (given by Trautwine and Stoney) of 41 lbs. per square foot has been shown by Trautwine himself to be insufficient. Tredgold gives 120 lbs. per square foot, a result obtained by actual experiment with men packed together as closely as possible on a platform of 20 ft. diameter, conducted by Mr. Nash, the architect of Buckingham Palace. Prof. Kernot obtained a result of 143 lbs. per square foot, while Mr. Stoney found by experimenting with 58 men at one time and 76 at another he obtained a weight of 147.4 lbs. per square foot. Therefore, in round figures, from 140 lbs. to 150 lbs. per square foot may be considered the actual weight of a crowd of *stationary* human beings, but for bridges or any place where the crowd is *moving* a greater weight must be allowed for in addition to calculations for the resistance to strains caused by movement.

Mr. Kidder (Boston, 1885) states that for dwelling houses it is not necessary to allow for more than 40 lbs. per square foot, and in most cases 80 lbs. per square foot for assemblages of people will be sufficient. He gives the following table of weights in addition to the weight of the floors:

For street bridges for general traffic	80	lbs.	per square foot.
" floors of dwellings	40	"	"
" churches, theatres, ball-rooms	80 to 120	"	"
" schools	80	"	"
" hay lofts	80	"	"
" storage of grain	100	"	"
" warehouses and general merchandise	250	"	"
" factories	100 to 400	"	"

Special calculations should be made for weights of particular loads on floors.

Wooden floors for dwellings weigh per sq. ft. (on the aver.)	17 to 22 lbs.
Wooden floors for public buildings	25 lbs.

USES OF RESIN.

There are many useful purposes to which resin can be applied outside those of general practise. As a non-conductor of heat it is used as a protector of water pipes, particularly in the crossing of bridges, where the pipe is laid in a long box and the whole filled with melted resin. Resin is also used in supporting basement floors in machine shops which may be laid over some dry material, as spent moulding sand, which is carefully levelled off and the planking laid upon temporary supports separating it about 2 inches above the sand. Numerous holes about 2 inches in diam. being bored through these planks, melted resin is forced through them by means of funnels until the whole space is solidly filled and then the upper flooring is laid upon these planks. In case the floor is subjected to shocks sufficient to break the resin it rapidly joins together again in much the same manner as the relegation of ice. Resin is also used to form water proof paper for use in butcher's shops, fish markets, and also for building purposes, and strange to say, this improvement reduces the cost of the paper. All methods of applying resin in solution after the paper is finished adds heavily to its cost, and also renders it very brittle; but if the resin is dissolved in potash and mixed with the pulp in the beating engine and this alkali afterwards treated with alum, it becomes neutralized and washed away, leaving the finely diffused resin throughout the whole mass. It is also used for protecting the coarser manufactured products, such as agricultural implements, against rust, by mixing it with a solution of benzine. This is applied as a varnish, and the benzine rapidly dries away leaving a coat which protects the material until it goes to the severe service of actual use.

LIGHTNING CONDUCTORS.

The immunity of private houses from injury by lightning, when unfurnished with regular conductors is much marked, and it is said to be due to the fact of the metal work on the roofs being connected with the eaves troughs and down pipes whereby no doubt the electric fluid finds a conductor and so is dispersed in the drain. In planning the roof covering it is as well to bear this in mind and to arrange for a continuation of metal whereby without going to the expense of a regular copper conductor, a conductor may be formed with the material that has to be used.

PANTILES.

A curved tile about 13½ inches long, 7 inches wide, ½ inch thick, rather more than half the weight of plain tiling, less secure in rough weather. To find the number of pantiles of the above dimensions to cover a roof, the weathering being 10 inches, multiply the area in superficial feet by 1.80. To find the weight in tons, multiply the area in superficial feet by .00377.

PUTTY FOR REPAIRING BROKEN WALLS.

Equal parts of whiting and plaster of paris walls may be coloured immediately after the application of putty. Whiting and size is not a good mixture, as it rises above the surface of the walls and shows patches. Lime must not be used as it destroys colour.

WROUGHT IRON WELDED TUBES.

FOR STEAM, GAS, OR WATER.

⅛ to 1 inch, inclusive, Butt-Welded. Tested to 300 lbs. per sq. inch, Hydraulic Pressure.

1¼ inch and upwards, Lap-Welded. Tested to 600 lbs. per sq. inch, Hydraulic Pressure.

Nominal Size.	Outside Dia. Standard.	Inside Dia., Standard.	Weight per foot. Lbs.	Threads to in. of Screw.	Inside area. Sq. inches.
⅛	.40	.27	.24	27	.0572
¼	.54	.36	.42	18	.1018
⅜	.67	.49	.56	18	.1886
½	.84	.62	.85	14	.3019
¾	1.05	.82	1.12	14	.5281
1	1.31	1.04	1.67	11½	.8495
1¼	1.66	1.38	2.25	11½	1.4957
1½	1.90	1.61	2.69	11½	2.0358
2	2.37	2.06	3.66	11½	3.3329
2½	2.87	2.46	5.77	8	4.7529
3	3.50	3.06	7.54	8	7.3529
3½	4.00	3.54	9.05	8	9.8423
4	4.50	4.02	10.72	8	12.6924
4½	5.00	4.50	12.49	8	15.9043
5	5.56	5.04	14.56	8	19.9504
6	6.62	6.06	18.77	8	28.8426
7	7.62	7.02	23.41	8	38.7048
8	8.62	7.98	28.35	8	50.0146
9	9.68	9.00	34.07	8	63.6174
10	10.75	10.01	40.64	8	80.1186

Lap-Welded American Charcoal Iron Boiler Tubes.

TABLE OF STANDARD SIZES.

External Diameter.	Internal Diameter.	Thickness.	Length Pipe per sq. foot of outside surface	Internal Area.	External Area.	Weight per foot.
In.	In.	In.	Feet.	In.	In.	Lbs.
1	.836	.072	3.819	0.575	0.785	0.7
1¼	1.100	.072	3.056	0.960	1.227	0.9
1½	1.334	.083	2.547	1.396	1.767	1.25
1¾	1.500	.095	2.183	1.911	2.405	1.66
2	1.804	.098	1.909	2.556	3.142	1.98
2¼	2.054	.098	1.698	3.314	3.976	2.23
2½	2.284	.109	1.528	4.094	4.939	2.75
2¾	2.535	.109	1.390	5.039	5.940	3.04
3	2.785	.109	1.273	6.083	7.069	3.33
3¼	3.012	.119	1.175	7.125	8.296	3.95
3½	3.262	.119	1.091	8.357	9.621	4.27
3¾	3.512	.119	1.018	9.687	11.045	4.59
4	3.741	.130	0.955	10.992	12.566	5.32
4½	4.241	.130	0.849	14.126	15.904	6.01
5	4.72	.140	0.764	17.497	19.635	7.22
6	5.699	.151	0.637	25.509	28.274	9.34

Rule for Strength of Cylinder Boilers.

S = tensile strength of the iron.
T = thickness of plate, in inches.
D = diameter of shell, in inches.
P = bursting pressure.

Then $P = \frac{T \times S}{D} \times 2$, and $T = \frac{P \times D}{S \times 2}$

Working strain allowed by U. S. laws for single-riveted boilers 1-6, and for double-riveted boilers 1-5 the bursting pressure.

FORMULAE FOR CAST AND WROUGHT IRON PILLARS.

These formulæ are intended to apply to pillars with flat ends, of any length and any form of section.

w = breaking load in lbs. per square inch.

$\frac{w}{6}$ = safe load for cast iron.

$\frac{w}{4}$ = safe load for wrought iron.

l = length of pillar in inches.

h = exterior diameter of round, or least exterior dimension in inches if otherwise shaped.

f = a co-efficient of the material in respect to compression.

a = a co-efficient of the material in respect to flexure.

$$f = \begin{cases} 36.000 \text{ for wrought iron.} \\ 80.000 \text{ for cast iron} \end{cases}$$

$$a = \begin{cases} \frac{1}{4500} \text{ for wrought iron.} \\ \frac{1}{400} \text{ for cast iron.} \end{cases}$$

$$w = \frac{f}{1 + a\left(\frac{l}{h}\right)^2} = \begin{cases} \frac{36.000}{1 + \frac{1}{4500}\left(\frac{l}{h}\right)^2} & \text{For wrought iron.} \\ \frac{80.000}{1 + \frac{1}{400}\left(\frac{l}{h}\right)^2} & \text{For cast iron.} \end{cases}$$

RULES FOR OBTAINING APPROXIMATE WEIGHT OF WROUGHT IRON.

For round bars.—Multiply the square of the diameter in inches by the length in feet and that product by 2.6. The product will be the weight in lbs., nearly.

For square and flat bars.—Multiply the area of the end of the bar in inches by the length in feet and that by 3.32. The product will be the weight in lbs., nearly.

Wrought iron usually assumed:

1 cubic foot.....	=480 lbs.
1 sq. foot 1 in. thick ..	= 40 lbs.
a bar 1 in. sq., 1 ft. long	=3⅓ lbs.
" 1 yd. long	= 10 lbs.

Specific gravities:

Cast iron.....	average	7.21
Wrought iron.....	"	7.28
Cast steel	"	7.85
Bessemer steel.....	"	7.86

Shrinkage in castings:

Pipes	=⅛ in. in 1 ft.	Zinc	=$^{1}/_{16}$ in. in 1 foot.
Girders, beams, etc	=⅛ in 15 ins.	Lead	= " "
Thin brass	=⅛ in. in 9 ins.	Copper....	=$^{1}/_{16}$ "
Thick brass	= " 10 ins.	Tin.....	=¼ "

TO REMOVE RUST FROM STEEL.—½ oz. cyanide of potassium, ½ oz. castile soap, 1 oz. whiting and water, to make a paste. Brush the rusted parts with this compound.

TO PRESERVE STEEL FROM RUST.—1 caoutchouc, 16 turpentine; dissolve with a gentle heat, and add 8 parts boiled oil. Mix by bringing them to a temperature of 212° Fahr., and lay on with a brush.

TABLE SHOWING WEIGHT SUSTAINED WITH SAFETY BY A COLUMN OF CAST IRON.

Length or height in feet.	8	10	12	14	16	18	20	22	24
Diameter in inches.	WEIGHT IN CWTS.								
2½	91	77	65	55	47	40	34	29	25
3	145	128	111	97	84	73	64	56	49
3½	214	191	172	156	135	119	106	94	83
4	288	266	242	220	195	178	160	144	130
4½	379	354	327	301	275	251	229	208	189
5	479	452	427	394	365	337	310	285	262
6	573	550	525	497	469	440	413	386	360
7	989	959	924	887	848	808	765	725	686
8	1289	1259	1224	1185	1142	1097	1052	1005	959
9	1672	1640	1603	1561	1515	1467	1416	1364	1311
10	2077	2045	2007	1964	1916	1865	1811	1755	1697
11	2520	2490	2450	2410	2358	2305	2248	2189	2127
12	3020	2970	2930	2900	2630	2780	2730	2670	2600

STRENGTH OF STRUCTURAL IRON AND STEEL.

The greatest strength of cast iron is resistance to crushing, hence it is applicable for columns. Its strength as a girder is greater than wrought iron, but its comparatively brittle character makes it inapplicable for this purpose, where it would be subject to jarring. Its most important element is probably its stiffness.

In general cast iron should be used wherever its strength can be made so far in excess of any strain that can be put upon it that there is no necessity of applying calculations to determine the strength. The only exception to this is its use in columns supporting a perfectly dead load.

Wrought iron is strongest under tension, not so strong as a girder, and weakest under compression. Its extreme between the strongest and the weakest is not so great as in cast iron, consequently it may be used in any position, but its strength and stiffness under compression are so much less than cast iron that except for special reasons it is not used in compression.

Wrought steel may be said in general to have the same characteristics as wrought iron slightly exaggerated, and is therefore suitable for the same purposes. Its use is recommended in place of wrought iron where extra strength is required without increase of size.

Cast steel, except those grades for tools, has the same characteristics as cast iron, but is stronger in every way and not so brittle.

A PLAN FOR CUTTING IRON RAILS.

An ingenious method is followed in some German steel works to secure rails of exactly the same length. During the process of cutting it often happens that even with the same gauge one rail will be longer than the others owing to the different heat at which they enter the saws. Those which were the hottest when cut are shortest when cold, having contracted more than the others after cutting. In the German mills the workmen look at the heated rail through a dark glass, so tinted that when the metal has cooled to a certain temperature the rails cannot be seen at all. A dark blue or orange yellow glass will make a red hot rail invisible. It may be considered a fact that any two rails looked at through the same pair of glasses will disappear at the same temperature. If every rail is allowed to cool until it is just invisible through a certain pair of glasses all will be of the same temperature and their lengths will be the same.

EXAMINING IRON CASTINGS.

Strike the edges with a light hammer. If the blow makes a slight impression the iron is probably of good quality provided it be uniform throughout. If fragments fly off and no sensible indentation is made, the iron is hard and brittle. Air bubbles are a common and dangerous source of weakness. They should be searched for by tapping the casting all over with a hammer. Bubbles or flaws filled in with sand cause a dulness in the sound which leads to their detection. The exterior surface of the metal should be smooth and clear, and edges sharp and perfect. The surface of a fracture should be of a uniform bluish grey color and high metallic lustre.

NOTES CONCERNING THE SPECIFICATIONS OF QUALITY FOR IRON.

The tensile strength of iron is properly determined by ascertaining the load under which permanent set takes place, and the amount of stretch under the proof load, rather than from the ultimate load that causes the fracture of the bar. In other words, *the elastic limit* rather than the breaking strain should be regarded as the measure of quality in a bar, and working loads should be proportioned with reference to the elastic limit instead of to the so-called *ultimate strength.*

Tough, sinewy iron is what is required in a tension bar, and although a hard, unyielding iron may show greater ultimate strength under a gradually applied strain, yet it is not suitable for use under tension for the reason that a sudden shock may cause it to snap under a weight that it ought to carry with entire safety.

Good bar iron should be of uniform character and possess a limit of elasticity of not less than 25,000 pounds per square inch. The ultimate resistance of prepared test-bars having a sectional area of about one square inch for a length of 10 inches should be not less than 50,000 pounds per square inch when the test-bars have been prepared from full-sized bars having not more than 4 square inches of sectional area. For each additional square inch of full-sized bar area above 4 square inches a reduction of 500 pounds per square inch may be allowed down to a minimum ultimate resistance of 46,000 pounds. The amount of stretch under the breaking load should be not less than 15 per cent. in 10 inches of the test-bar.

Bars that are to be used in tension should stand, without cracking, a coal bending test to 90 degrees to a cuvature the radius of which is about the thickness of the bar under test, and at least one-third of the lot should stand bending to 180 degrees under the same conditions.

A round bar, one inch in diameter, should bend double, cold, without signs of fracture. A square bar of the same quality may show cracks on the edges under sucha test.

Under a breaking pull the reduction of area should be not less than 25 per cent. of the original section.

The shape of a bar has much influence in determining the breaking-strain. The ultimate strength of round bars is, for this reason, considerably greater than that of flat bars, but in either case the elastic limit will be found to occur at about the same point for equally good qualities of iron.

Within the elastic limit the extension of iron may, for all practical purposes, be stated as follows:

Wrought iron, one ten-thousandth of its length per ton per square inch.

Cast iron, one five-thousandth of its length per ton per square inch.

The compression of wrought iron within the limits of elasticity follows the same law, and the amount of shortening under pressure will be in direct proportion to the weight applied. But with cast iron the amount of compression does not follow a constant ratio, the compression per ton becoming greater with the increase of the weight. Thus, a cast iron bar, one square inch in section was compressed one fifty-nine-hundredths of its length by a load of one ton; but under a load of 17 tons, instead of being compressed seventeen fifty-nine-hundredths, it was compressed twenty fifty-nine-hundredths.

THE MODULUS OF ELASTICITY is a term used to designate such a *weight* as would extend a bar through a space equal to its original length, supposing the elasticity of the bar to be perfect. Or, the modulus of elasticity of any given material in *feet* is the height in feet of a column of this material, the weight of which would extend a bar of any determinate length through a space equal to this length. Thus, if one ton extends an inch bar of wrought iron one ten-thousandth of its length, it is evident that, upon the supposition that the bar is

perfectly elastic, 10,000 tons would extend it to twice its original length. Hence, on this assumption, 10,000 tons, or 22,400,000 pounds, will be the modulus of elasticity of the wrought iron stated in *weight*. But an inch bar of wrought iron to weigh 22,400,000 pounds, at 3⅓ pounds per foot, would be 6,720,000 feet long, and this would express the modulus of elasticity in *feet*.

The modulus of elasticity will of course, vary according to the character of the material tested, being much higher in the better than it is in the lower grades of iron, but it forms a very useful and convenient standard of comparison in determining quality.

THE WAY PORTLAND CEMENT IS MADE.

Portland cement is an artificial product, chemically proportioned by the proper selection of the material entering into its composition. These whether chalk or clay, as in England, marl or clay as in Germany, or hydraulic limestones, ar in this country, are in every case reduced to the finest powder by either wet os dry grinding, and this powder moistened merely in the dry process, or in the form of paste in the wet process, becomes practically, either by drying in large tanks or by being moulded into bricks, eggs, or other form, a new stone, into which all the elements are brought in close contact and are in perfect chemical proportion. The artificially made new stone, burnt, as it is, at high heat in close kilns, has every element chemically active, and the clinker represents practically, when properly proportioned chemically, a composition of bi-basic silicate of lime and aluminate of lime. This ground clinker is the Portland cement of commerce, a fixed uniform product, sold under a warranty of its strength and firmness, and depends upon the controllable elements of skillful manufacture for its character and uniformity.

PRESERVING STONE.

About a year ago I watched with great interest the operation of the workmen [illegible] building devoted to the manufacture of candy in this city. The building was brick, and the men were engaged in holding little charcoal furnaces about a foot square against the outside walls. They went over every square foot of this building—and it was five stories high by about seventy-five feet deep—holding the glowing coals against the brick sides. My curiosity on the subject was somewhat aroused, and upon inquiry I found that it was a new process for preserving brick and making it impervious to the storms of winter. Now I find that the same process is being used on obelisk, and that these little charcoal furnaces are burning the sides of Cleopatra's Needle from the base to the apex. This famous stone, that has stood the storms of centuries in Egypt, was beginning to succumb to the curious climate of the United States, and fears were entertained that a few more winters would make serious inroads upon it; but someone suggested burning it with paraffine, and it is now being done. The heat is so intense that it is burned in for a full inch; then when the stone cools again it is as hard as adamant.—*New York Letter.*

Soapstone incorporated with oil, after the manner of a paint, is said to be superior to any kind of paint as a preservation. Soapstone is to be had in an exceedingly fine powder, mixes readily with prepared oils for paint use, covers well surfaces of iron, steel, or stone, and is an effectual remedy against rust. It has been known to protect some stonework, such as obelisks, in China for ages past.

HINTS FOR PLASTERERS

THE MAKING OF MORTAR.

THE making of mortar, comprehends the slacking of lime and the mixture of ingredients worked up with it. As we have already seen, both the former process and the nature of the latter differ, according to the nature of the lime to be dealt with. It is, however, an universal rule, in contradiction to the slovenly practice of some builders, that all limes, of what nature soever, should be reduced to a paste before being mixed with the other ingredients. People who have not studied the actions of the hydrates in a scientific and consecutive manner, oppose the introduction of the previous manipulation of the lime on the score of the extra expense, and on the pretence that the lime loses in strength thereby. As to the objection of the expense, that must of course be estimated by the importance of the work. The second objection is to be met by observing that the rich limes require to be for a long time exposed to the air to enable them to take up the carbonic acid gas, and that, therefore, so far from losing, they gain by exposure; and, moreover, the hydraulic limes being very difficult to slack it is necessary that all their particles should be put in contact with the water. If the lime be not previously reduced into the state of a perfect hydrate, it is always exposed to blister, and to disintegrate, in a manner depending upon the comminution of its particles before being employed; for it is evident that if the lime be ground, the more inactive particles are in a more favorable condition for the absorption of the water. The degree of consistence of this paste should vary with the nature of the extraneous matter. It should be stiff whenever it is intended to form a guage for substances whose particles are hard and palpable, and which are capable of preserving sensible distances from one another. It should be more liquid when the substances to be mixed with it are pulverulent, of impalpable and fine grains, presenting an homogeneous appearance, and in which it is impossible to distinguish the separate elements, such as the puozzolanos, &c. To secure a proper state of the hydrate, it is of very great importance, however, not to use too much water in slacking the lime. So much should be used, and only so much, as is necessary to cause the quicklime to fall to powder. It is also equally important not to mix up into the state of paste more lime than is immediately required to be used; for although, upon being reworked, the hydrates, which begin to carbonite, give off the water they had rendered latent, as it were, yet a portion of their force must be lost by their doing so in proportion to the degree of advancement of the process. In France, whenever great care is required in the fabrication of the mortars, the lime is worked up into a paste in a mill, consisting of two vertical stones working in a trough. The lime, after going through this operation, is then mingled with the sand in a pug-mill or by hand, upon a floor. If the dimensions of the constructions should be such as to justify the expense, it should be made a neces

sary condition that mechanical means be employed, for even with the greatest possible care the mixture by hand is never perfectly effected. The quantities of sand to be used vary, as might be expected, according to the nature of the limes, and also of this sand. Within certain limits, if they do not gain by the mixture, at least their effect is not sensibly diminished. Thus we find that, for the rich limes, the resistance is rather increased if the sand be in the proportions varying from 50 to 240 per cent of the paste measured in bulk in the state of a firm paste. Beyond that point the resistance decreases. The resistance of hydraulic limes increases, if the sand be mixed in the proportion of 50 to 180 per cent of the paste; from thence it decreases. The much greater proportion of sand the rich limes are able to support, may perhaps account for the partiality of the builders in their favor. If it be required to mix common lime and puozzolanos, the best proportions according to General Treussart, are 1 of lime in powder to 2 of trass; or 1 of lime to 1 of sand, and 1 of puozzolano or trass. The best hydraulic limes, as we have seen, lose much of their qualities if long exposed to the air; it is therefore advisable to work them only for the time absolutely necessary to ensure, firstly, their perfect reduction to the state of hydrates; and secondly, the intimate mixture of the lime and sand. The rich limes, however, as we have before said, inasmuch as they absorb the carbonic acid gas with difficulty, gain by being exposed for a longer period to the contact of the atmosphere. As far as such a proceeding is consistent with economy, it is advisable then, to protract the operation of their manipulation as much as possible; it is even advisable to work up large quantities of such mortar beforehand, which are subsequently rendered fit for use by a second manipulation. Some of Vicate's experiments show that all limes lose two- fifths of their strength if mixed with too much water. It is then better to wet the material to be used, and to employ a stiff mortar than to follow the course usually adopted by masons and bricklayers of using very fluid soft mortar. The system of grouting is more than questionable in its results; the lime suspended in it is nearly destroyed, the extra quantity of water is but an addition to the difficulties of setting opposed to the mortar already in place. There are conditions of the atmospheric state which affect the goodness of the mortars, about whose actions the best authorities are not decided. For instance those made in summer are always worse than those made in winter. It has been supposed by some that this fact is accounted for by the too rapid desication of the mortar; and Vicate even asserts that they lose four-fifths of their strength if allowed to dry very rapidly. He recommends, in consequence, that the masonry be watered during the summer months, in all constructions of importance, to guard against this danger. Probably the the hydrates are not in a favorable condition to absorb the carbonic acid gas, if they be allowed to dry rapidly; the presence of the water being necessary for the combination of the lime and the carbon. The freedom of the water from carbonic acid gas in solution is also a necessary condition of the successful use of the hydraulic limes. Their success depends, in fact, upon the slow gradual manner in which they take up that gas from the atmosphere, and crystallized about the nuclæi offered to their actions. Some engineers prescribe that the water should be deprived of such impurities by boiling, and although the precaution be rather exaggerated, it is certainly of a useful tendency. As the lime reduced into a paste does not fill up the voids of the materials it is mixed with, there is necessarily a very considerable diminution of bulk upon the quantities of the respective substances taken separately. The exact amount of this diminution varies of course with the limes or sands employed; but as a general rule it may be taken as about three-fourths of their collective volumes. To state this in a convenient formula; is a = the bulk of the lime, b = the bulk of the sand; then (a+b) × 0.75 = the bulk of the mortar they will produce The

position in which a mortar of any description is to be used, also modifies the proportions of sand which it is desirable to mix with it. Under ground, in the water, and in damp positions, less is and should be employed than in the open air, where it is exposed to the changes of the atmosphere. It is often a matter of importance to know the power of resistance of mortars, but, as they differ within a very large range, it is not easy to state it very precisely. The best experiments, however, show that we may safely calculate for all practical purposes upon a resistance of 14 lbs. avordupois per inch superficial, to a force acting in a direction to tear asunder — an effort of longitudinal traction—of 42 lbs. to a crushing force; and of 5¾ lbs. per inch superficial to a force tending to make the particles slide upon one another. It would not be safe to expose new works to greater efforts than those which could be classed under the above heads.

Plastering is always measured by the square yard for all plain work, and by the foot superficial for all cornices of plain members, and by foot lineal for enriched or carved mouldings in cornices.

By plain work is meant straight surfaces (like ordinary walls and ceilings,) without regard to the style or quality of finish put upon the job. Any panneled work, whether on walls or ceilings, run with a mould, would be rated by the foot superficial.

Different methods of valueing plastering find favor in different portions of the country. The following general rules are believed to be equitable and just to all parties ;

Rule 1.—Measure on all walls and ceilings the surface actually plastered, without deducting any grounds, or any openings of less extent than seven superficial yards.

Rule 2.—Returns of chimney breasts, pilasters, and all strips of plastering, less than 12 in. in width, measure as 12 inches wide ; and where the plastering is finished down upon the washboard surbase or wainscoting, add 6 inches to height of walls.

Rule 3.—In closets, add one-half to the measurement ; or if shelves are put up before plastering, charge double measurement. Raking ceilings and soffits of stairs, add one-half to the measurement. Circular or elliptical work, charge two prices ; domes or groined ceilings, three prices.

Rule 4.—For each 12 feet interior work is done further from the ground than the first 12 feet, add five per cent. For outside work, add one per cent. for each foot the work is done, above the first 20 feet.

Rule 5.—Round corners measure per foot lineal extra. Arrisses (other than chimney breasts) measure per foot lineal. All joinings of *new* plastering to old measure lineal by 1 ft. in width extra. *This* does not apply to patching or repairing, which should be done at an agreed price.

Any *furring* or *straightening* of joist or studding to be charged for by day's time, but the owner or main contractor should be notified of the necessity of such work before it is done by the plasterer, or at his expense.

AMOUNT OF MATERIALS REQUIRED FOR PLASTERING 100 SQUARE YARDS (AVERAGE), "TWO COAT" OR "COAT AND SKIM" WORK.

Sand, ordinary work	40 cubic ft
Lime, " " with common sand	6 bushels.
Hair, ½ in. wide, nailed ⅜ in. apart	1440
Nails, 3rd fine, studding or joist 16 in. apart	10 lbs.
Nails, 3rd fine, studding or joist 12 in. apart	12 lbs.

Hints for Painters and Decorators.

PAINTING is measured by the superficial yard, girting every part of the work that is covered by paint, and allowingan ad 'ition to the actual surface for the difficulty of covering deep quirks or mouldings, carved or enriched surfaces, as in iron railings, and for "cutting in" as in sash and shelving, or where there is a change of color on same work. Allowances are frequently made for distance from the ground, as in cornices, balconies, dormers, etc. Charges are usually made for each coat of paint put on, at a certain price per yard sup. and per coat. Graining and Marbling (imitations of wood and stone,) are classed differently, and rated at different prices from plain work ; and so also with Varnishing.

The following Rules of Measurement, which are based upon, and a fair average of those in use in many sections of the country, are suggested as being equitable and just to both employer and employed, and a reliable standard of valuation.

Rule 1.—All surfaces less than 6 inches wide, or girt, to be measured as 6 inches ; and over 6 inches and under 12 inches, to be measured as 12 inches ; over 12 inches, to be taken sup. nett.

Rule 2.—All openings to be deducted nett, and all jambs and reveals to be measured as per Rule 1.

Rule 3.—Window sash, when there are more than two lights, to be measured square (as if solid.) Two, and single-light sash to be measured as per Rule 1.

Rule 4.—In measuring doors, panneled shutters, and plain pannel work, girt in and out of pannels both ways and add one edge to each side of door or shutter. Measure sash-doors solid. For batten doors, girt over battens for height ; and if beaded, add 1 inch in width for each bead.

Rule 5.—Measure Venetian blinds or shutters as if square plain pannels, and add one hundred per cent. for labor of working in the slats, etc.

Rule 6.—Measure all architraves, casings, jambs, base, cornices, and similar moulded work, by girting every part of the work covered ; and in carved or enriched work add per ft. sup. nett for amount of such work. Girt dentil work twice.

Rule 7.—For consoles, modillions, brackets, cantilevers, ornamental iron work, balusters, lattice work, and paling or balustrade fences, girt in each direction, and add one hundred per cent. to prices of plain work.

Rule 8.—All "picked out" work to be valued by the measurer according to amount of labor performed ; and all work not specified in preceding Rules to be rated at an average of rates for other work.

Rule 9.—For "knotting," puttying and cleaning off each coat with sand-paper, add five per cent. to prices of plain work (not graining or marbling). For cutting down with pumice-stone and water, add ten per cent. more.

Rule 10.—For all work done above level of ground, if interior work, add five per cent. for each story of 12 feet or less, above first story. For exterior work,

add one per cent. for each foot of height above the first 12 feet. For *exterior walls*, take half the whole height as the average height.

Rule 11.—For change of colors on pannel work, cornices, washboard, etc., add one-fifth for each tint employed. On paling or picket fences, if the tops are painted different colors from the rest of the fence, add six inches to height of fence.

ABOUT PAPER HANGING.

An eight or ten inch bristle smoothing brush, a six to eight inch paste brush, a fourteen to sixteen inch pair of shears, a paper knife, seam roller, plumb-bob, chalk line, paste pail, size kettle, paper boards, trestles and step-ladder, these are the necessary tools for general work, though it is necessary to save time and trouble to have besides these tools a good sized kalsomine brush and a double width putty knife.

The next we need to proceed with is a bucket of paste. Use flour paste, except on very rare occasions when the tints are very delicate. The best patent flour is the most adhesive, and retains its consistency much better than starch.

Take a common patent pail and put in one-half gallon of flour. Stir in enough cold water to mix a flour batter; work out all the lumps thoroughly; have ready three gallons of absolutely boiling water, and stir this until you have enough to cook it. Now pour a little cold water over the top to prevent skinning over until you are ready to use it. You can thin it down at pleasure.

If the paper put on is not a metallic ground put in four or five ounces of alum in the paste. This will prevent its turning sour and hasten drying. Should the paper be metallic, use a little carbolic acid in place of alum, as alum is liable to turn gilt dark.

If the room you are going to paper is a hard finish, and not very badly smoked up, all that is necessary to prepare the walls is to brush them with a broom. Should they be smoked and dirty, it is best to go over them with a weak solution of glue and alum. If the walls have been papered before it is necessary to go over them again with a putty knife and cut the old paper off, pull out all nails, and with some plaster of Paris mixed with paste heal all the bad places.

If the walls have been whitewashed, doctor them with a strong solution of vinegar. Having the walls ready, lay a roll of paper on the boards, and with your straight-edge, which should be six feet long, measure the height to where the border will come and about an inch below the baseboards, and cut the strips off. Match the next strip to the top of the previous one and cut enough strips to cover the room.

To ascertain the number of strips required, take a roll of paper and count the number around the room. Now turn the paper over if you have trimmed it; put the trimmed edges towards you and pull the first over, so that it covers the other strips. This is to prevent the paste from forming on the trimmed edge and making bad work.

Some paper-hangers never trim the paper till after it is pasted. This procedure has some good features and some bad ones, which we will not discuss here. Beginners will find it better to have the paper trimmed beforehand. Commence at one end of the room and hang the slips as nearly perpendicular as you can.

Always brush the paper from the centre down and at either side. If you have wrinkles in the paper pull it off to where the wrinkle is and brush it out from the centre. Run the shears along the paper at the top of baseboards, and cut off nice and even. Never allow the paper to look haggled or unevven around the base, and cut it close down, but not overlapping.

When you come to an opening let the paper overlap, and trim with the paper

knife as you work a saw. You will next need short strips, but do not run them beyond the opening unless the piece cut out of the other side will fill up the opposite ; rather lap back again to be sure of a perfect match.

When you come to a corner, never lap the paper around it unless the space is very narrow. Fold up the strips at both ends measure the distance with your ruled shears, lay the straight-edge on the paper, mark the distance just a little beyond the corner, and cut. In this manner you will always have corners that will be square and stay in position.

Use the same roller, and roll the seams nicely as you go. Cut the border in such lengths as can be easily reached to put on, paste and double up at both ends, so that the lines meet, exactly and cut."

USEFUL INFORMATION.

A gallon of water (U. S. Standard) weighs 8⅓ pounds and contains 231 cubic inches.

A cubic foot of water weighs 62½ pounds, and contains 1,728 cubic inches, or 7½ gallons.

Each nominal horse-power of boilers requires one cubic foot of water per hour.

In calculating horse-power of boilers, consider for tubular or flue boilers 15 square feet of heating surface, equivalent to one horse-power.

Condensing engines require 20 to 25 gallons of water to condense the steam evaporated from one gallon of water.

To find the pressure in pounds per square inch of a column of water, multiply the height of the column in feet by .434. (Approximately, every foot elevation is called equal to one-half pound pressure per square inch.)

To find the capacity of a cylinder in gallons. Multiplying the area in inches by the length in stroke in inches will give the total number of cubic inches ; divide this amount by 231 (which is the cubical contents of a gallon in inches), and the product is the capacity in gallons.

Ordinary speed to run pumps is 100 feet of piston per minute.

To find quantity of water elevated in one minute running at 100 feet of piston per minute. Square the diameter of water cylinder in inches and multiply by 4. Example : capacity of a five-inch cylinder is desired : the square of the diameter (5 inches) is 25, which, multiplied by 4, gives 100, which is gallons per minute, (approximately).

To find the diameter of a pump cylinder to move a given quantity of water per minute (100 feet of piston being the speed), divide the number of gallons by 4, then extract the square root, and the result will be the diameter in inches.

To find the velocity in feet per minute necessary to discharge a given volume of water in a given time, multiply the number of cubic feet of water by 144 and divide the product by the area of the pipe in inches.

To find the area of a required pipe, the volume and velocity of water being given, multiply the number of cubic feet of water by 144, and divide the product by the velocity in feet per minute. The area being found, it is easy to get the diameter of pipe necessary.

The area of the steam piston, multiplied by the steam pressure, gives the total amount of pressure exerted. The area of the water piston, multiplied by the pressure of water per square inch gives the resistance. A margin must be made between the power and resistance, to move the pistons at the required speed ; usually reckoned at about 50 per cent.

PIGMENTS.

PIGMENTS AFFECTED BY EXPOSURE TO LIGHT AND THE NORMAL ATMOSPHERE.

RED—Pure scarlet, carmine, crimson lake, scarlet lake, Indian lake, dragons blood.

YELLOW—King's yellow, citron yellow, stronian yellow, yellow lake, Italian pink, gamboge, extract of gamboge, gallstone, Indian yellow.

GREEN—Chrome green, Hooker's green, Prussian green, sap green.

BLUE—Prussian blue, Antwerp blue, cyanine blue, indigo, intense blue.

PURPLE—Purple lake, burnt carmine, burnt lake, violet carmine, Indian purple.

BROWN—Bone brown.

CITRINE—Brown pink.

OLIVE—Olive lake, olive green.

GRAY—Neutral tint, Payne's gray.

PIGMENTS AFFECTED BY AN ATMOSPHERE CONTAINING SULPHURETTED HYDROGEN.

WHITE—Flake white, cremnitz, blanc d'argent.

RED—Pure scarlet, red chrome.

ORANGE—Orange chrome.

YELLOW—Deep chrome yellow, pale chrome yellow, Naples yellow.

GREEN—Chrome green, emerald green, malachite green, verdigris.

BLUE—Cerulean blue, cobalt blue, smalt, cyanine blue.

PURPLE—Indian purple.

PIGMENTS WHICH SUFFER CHANGE BY ADMIXTURE WITH WHITE LEAD AND OTHER LEAD COMPOUNDS.

RED—Pure scarlet, carmine, crimson lake, madder carmine, rose madder, scarlet lake, pink madder, madder lake, Indian lake, dragon's blood.

YELLOW—King's yellow, yellow lake, Italian pink, gamboge, extract of gamboge, Indian yellow, gallstone.

GREEN—Sap green.

BLUE—Indigo, intense blue.

PURPLE—Purple lake, burnt carmine, burnt lake, Indian purple, violet carmine.

CITRINE—Brown pink.

OLIVE—Olive lake, olive green.

PIGMENTS WHICH ARE DECOMPOSED BY ADMIXTURE WITH OCHRES AND OTHER FERRUGINOUS SUBSTANCES.

RED—Pure scarlet, carmine, crimson lake, scarlet lake, madder carmine, rose madder, pink madder, madder lake.

YELLOW—King's yellow.

GREEN—Emerald green, malachite green, verdigris.

BLUE—Indigo, intense blue.

PURPLE—Purple lake, burnt carmine, burnt lake, Indian purple, violet carmine.

CITRINE—Brown pink.

OLIVE—Olive lake, olive green,

PERMANENT PIGMENTS.

Pigments which withstand the action of light, of atmospheric oxygen and moisture, of sulphuretted hydrogen, and which may be safely mixed with compounds of iron and lead :

WHITE—Zinc white, Chinese white, permanent white.

RED—The vermilions, Mars red, light red, Venetian red, Indian red, red ochre.

GRANGE—Cadmium orange, Mars orange, burnt sienna, burnt Roman ochre, neutral orange.

Yellow—Aureolin, cadmium yellows, lemon yellows, Mars yellow, raw sienna, yellow ochre, Roman ochre, transparent gold ochre, brown ochre.

GREEN—Oxide of chromium, transparent oxide of chromium, viridian, terre verte, cobalt green.

BLUE—Genuine ultramarine, artificial ultramarine, new blue, permanent blue.

PURPLE—Purple madder, Mars violet.

BROWN—Brown madder, Ruben's madder, bistre, Prussian brown, burnt umber, Verona brown, Vandyke brown, Caledonian brown, Cappah brown, asphaltum, Cologne earth, mummy, sepia, warm sepia, Roman sepia.

CITRINE—Raw umber, Mars brown.

GRAY—Ultramarine ash, mineral gray.

BLACK—Ivory black, lamp black, blue black, cork black, Indian ink, black lead.

[*Field's Chromatography.*]

TINTS FOR PAINTING AND DECORATING, WITH THEIR COMPOUNDING PIGMENTS.

The following is taken from *Painting and Decorating*, with the note that some pigments being so much stronger than others, it is impossible to give the exact quantities of each required. The pigments are, however, mentioned in the order of their importance in the mixture :

SHRIMP PINK—White lead, Venetian red and burnt sienna. A little pale English vermilion will enhance its richness.

BUTTERCUP YELLOW—White lead, lemon chrome yellow.

SPRUCE YELLOW—Frence ochre, white lead, with a small touch of Venetian red.

PEACOCK BLUE—Ultramarine blue, extra light chrome green and white lead.

COTRINE—White lead, orange chrome yellow and lamp black.

RUSSET—White lead, small quantity of lamp black, orange chrome yellow.

SLATE—White lead, raw umber, ultramarine blue and a trifle of lamp black.

MYRTLE—Dark chrome green, ultramare, lightened up with a small quantity of white lead.

MASTIC—White lead, French ochre, Venetian red, a trifle of lamp black.

TURQUOISE BLUE—White lead, cobalt blue, Paris green or extra light chrome green.

TAN—White lead, burnt sienna ; add a trifle of lamp black.

MAUVE—Yellow ochre, Venetian red, lamp black, a little white lead.

SALMON—White lead, French ochre, burnt sienna, with a touch of English vermilion (pale).

PRIMROSE—White lead, lemon or medium chrome yellow (according to the shade desired).

ECRU—White lead, French ochre, burnt sienna, lamp black. This tint varies greatly. It means *raw*. It is intended to show the tint of raw flax or hempen fabrics.

ASHES OF ROSES—Light Tuscan red, lamp black.

QUAKER DRAB—White lead, French ochre, lamp black and burnt sienna.

LEAF BUD—White lead, orange chrome yellow, light chrome green.

DREGS OF WINE——Dark Tuscan red, lamp black, to which add a trifle of white lead.

POMPEIIAN RED—Venetian red. If a richer tone is desired, use half and half American vermilion and Venetian red.

BROWN STONE—Orange chrome yellow, dark Tuscan red, lamp black; lighten up to suit with white lead.

LONDON SMOKE—Yellow ochre, ultramarine blue, lamp black; lighten up to suit with white lead.

BISMARCK BROWN—Burnt sienna, burnt umber, orange chrome yellow, lightened up with white lead.

AMBER BROWN—Burnt sienna, orange chrome yellow, burnt umber, lamp black; lighten up to suit with white lead.

SCARLET—Pale English vermilion, or the various scarlet reds, such as the new Idria, etc.

PURPLE BROWN—Dark Indian red, ultramarine blue, lamp black; lighten with white lead to suit.

YELLOW BRONZE—Lemon or medium chrome yellow, French ochre, a trifle of burnt umber.

CRIMSON—Dark English vermilion or the scarlet reds (deep shades); add some carmine, or, better, glaze with it.

EMERALD GREEN—Paris green. A good imitation can be had, answering most purposes, with extra light chrome green.

HAY COLOR—White lead, orange chrome yellow, light chrome green, Tuscan or Indian red.

ANTIQUE BRONZE—Orange chrome yellow, ivory black.

GAZELLE—Dark Tuscan red, Venetian red, lamp black; lighten up with white lead.

APPLE GREEN—White lead, light chrome green, orange chrome yellow.

RUSSIAN GRAY—White lead, ultramarine blue, pale Indian red, lamp black.

GOLDEN BROWN—French ochre, orange chrome yellow, lamp black; lighten up to suit with white lead.

GRAY GREEN—White lead, ultramarine blue, lemon chrome yellow, lamp black.

ELECTRIC BLUE—Ultramarine blue, white lead, raw sienna.

[*F. Maire.*]

SUBSTITUTE FOR PLASTER OF PARIS.—Best whiting 2 lbs., glue 1 lb., linseed oil 1 lb. Heat all together and stir thoroughly. Let compound cool, and then lay it on a stone covered with powdered whiting and heat it well till it becomes of a tough and firm consistence; then put it by for use, covering it with wet cloths to keep it fresh. When wanted for use it must be cut in pieces adapted to the size of the mould, into which it is forced by a screw press. The ornament may be fixed to a wall, picture frame, etc., with glue or white lead. It becomes in time as hard as stone.

HOW TO CLEAN VARIOUS SUBSTANCES, ETC.

Brass or Copper—1 oz. oxalic acid, 6 oz. rotten stone, ½ oz. gum arabic finely powdered, add 1 oz. sweet oil, and water to make a paste. Apply with flannel or wash leather.

Bronze—To remove fly specks—Lavender oil, 1 drachm; alcohol, 1 oz.; water, 1½ oz. Apply with soft sponge but rub as little as possible.

Bronze statuary—Weak soap suds and aqua ammonia.

Brushes, paint—Turpentine—press out all particles of color and hang brushes in water, not letting them touch the bottom of the vessel.

Engravings—Expose to the fumes of muriatic acid and wash with water. To remove ink spots, apply aqua fortis, diluting application with water as soon as any effect is observed. Dry off with blotting paper and repeat process. Dip in water in which a little potash has been stirred.

Floors—(*a*) Ink stains may be removed by rinsing with strong vinegar.

(*b*) Parafin oil, by applying a strong hot solution of oxalic acid, and scrubbing afterwards.

Gilt frames—Soap and water. Boil common size in water sufficient to cover it, strain through muslin and apply with camel's hair brush.

Glass, paint off—Take as much off with a knife as can be removed without scratching glass. Mix oil turps and pumice stone, and apply; clean off with a rag and soap wash, and polish with cotton rag.

Grease spots, before painting—Wash with saltpetre in solution or very thin lime whitewash; soap suds, if used must be well washed off or paint will not dry.

Grease from stone—Pour strong soda or boiling water over spot; lay over it fuller's earth made into a paste with boiling water; let it remain some hours.

Iron and steel—Saturate a spongy piece of fig wood tree with a mixture of sweet oil and finely powdered emery, and rub.

Ivory or bone—Brush with a thick paste of common whiting; wash off with water; dry gently near fire and brush again with one drop of alcohol. To remove smoke stains, dip in benzine.

Paint, to remove—4 lbs. Irish moss, 3 lbs. methylated spirits, 30 lbs. water, boiled; add solution of 16 lbs. caustic potash in 28 lbs. water; stir till cold, when it will be a gelatinous mass; apply with brush and allow it to stand for 24 hours; wash off thoroughly.

Varnish brushes—That have dropped, and so got dirty while in use—Clean out well in varnish; fill brush with varnish and place in keeper, dust will gradually sink; by cleaning with turpentine which is volatile dust and dirt are drawn up to the tin of the brush and will work out when brush is used again.

Wall paper, grease from—Lay blotting paper of several thicknesses over spots and press a hot iron against it.

Whitewash, to remove—A thick paste of wheat flour, with alum added in considerable quantity, applied with whitewash brush; shut door and windows and let it stand over night.

GOLD LACQUER FOR METALS.

1. Shellac	100	parts.
Alcohol	895	"
Boric acid	5	"
Picric	enough to colour.	
2. Shellac	120	parts.
Gamboge	30	"
Mastic	30	"
Sandarac	60	"
Aloes	10	"
Venice turpentine	30	"
Alcohol	750	"
3. Dragon's blood	7½	parts.
Gamboge	40	"
Mastic	30	"
Shellac	30	"
Elemi	7½	"
Sandalwood	20	"
Sandarac	20	"
Venice turpentine	15	"
Alcohol	850	"

POINTS TO PLUMBERS.

THE following pages on the hydraulics of plumbing are taken directly from the fifth edition (1884) of an excellent work on "House Drainage and Water Service," by James C. Bayles.

Water is practically an incompressible liquid, weighing, at the average temperature of sixty degrees F., about 62.3 pounds to the cubic foot, and 8.3 pounds to the gallon. These figures are subject to slight variations incident to changes in temperature.

A column of water 12 inches high exerts a downward pressure of about 0.43 of a pound to the square inch. A column two feet high exerts a pressure of about 0.86 of a pound, or just twice that exerted by a column one foot high. This pressure per square inch, due to head, is irrespective of volume, or any thing else except vertical height of column. With these figures in mind, the calculation of the pressure per square inch due to any head is a simple matter. The following rules will be found valuable for reference :—

TO FIND PRESSURE IN POUNDS PER SQUARE INCH EXERTED BY A COLUMN OF WATER.—Multiply the height of the column, in feet, by 0.43.

TO FIND THE HEAD.—Multiply the pressure, in pounds per square inch, by 2.31.

PRESSURE OF WATER.—The weight of water or of other liquids is as the quantity, but the pressure exerted is as the vertical height.

Fluids press equally in all directions : hence any vessel or conduit containing a fluid sustains a pressure on the bottom equal to as many times the weight of the column of greatest height of that fluid as the area of the vessel is to the sectional area of the column.

LATERAL PRESSURE.—The lateral pressure of a fluid on the sides of the vessel or conduit in which it is contained is equal to the product of the length multiplied by half the square of the depth and by the weight of the fluid in cubic unit of dimensions. The following formula is simple and satisfactory : Multiply the submerged area in inches by the pressure due to one-half the depth. By "submerged area" is meant the surface upon which the water presses ; for example, to find the lateral pressure upon the sides of a tank 12 feet long by 12 feet deep : 144 × 144 equals 20736 inches of side. The pressure at the bottom will be 12 × 0.43 equals 5.16 pounds, while the pressure at the top is 0, giving us, say, 2.6 pounds as the average ; therefore 20736 × 2.6 equals 53914 pounds.

DISCHARGE OF WATER.—The quantity of water discharged during a given time from a given orifice, under different heads, is nearly as the square roots of the corresponding heights of the water in the reservoir or containing vessel above the surface of the orifice.

If a cylindrical horizontal tube through which water is discharged be of greater length than its diameter, the discharge is much increased. It can be lengthened with advantage to four times the diameter of the orifice.

TO FIND THE NUMBER OF UNITED-STATES GALLONS CONTAINED IN A FOOT OF PIPE OF ANY DIAMETER.—Square the diameter of the pipe in inches, and multiply the square by 0.0408.

TO FIND THE NUMBER OF GALLONS DISCHARGED, WHEN THE HEAD LENGTH OF PIPE AND ITS DIAMETER, ARE KNOWN.—Divide the head of water in feet by the given length in yards, and the nearest number thereto in the table under the diameter will be found opposite the required number of gallons.

VELOCITY OF FLOW OF WATER.—Water which has a chance to flow down-

ward does so with a velocity in exact proportion to its head. The following table gives the velocity of flow of water due to heads of from one to forty feet :—

Velocity in Feet per Second due to Heads of from 1 to 40 Feet.

Head.	Velocity.	Head.	Velocity.	Head.	Velocity.	Head.	Velocity.
0.5	5 67	10.5	25.98	20.5	36.31	30.5	44.29
1.0	8.02	11.0	26.60	21.0	36.75	31.0	44 65
1.5	9.82	11.5	27.19	21.5	37.18	31.5	45.01
2.0	11.34	12 0	27.78	22.0	37.61	32.0	45.37
2.5	12.68	12.5	28.35	22.5	38.04	32.5	45.72
3.0	13.89	13.0	28.91	23.0	38.46	33.0	46.07
3.5	15.00	13.5	29.46	23.5	38.88	33 5	46.42
4.0	16.04	14.0	30.00	24.0	39.29	34.0	46.76
4.5	17.01	14.5	30.54	24.5	39.69	34.5	47.10
5.0	17.93	15.0	31.06	25.0	40.10	35.0	47.44
5.5	18.81	15.5	31.57	25.5	40.50	35.5	47.78
6.0	19.64	16.0	32.08	26.0	40.89	36.0	48.12
6.5	20.44	16.5	32.58	26.5	41.28	36.5	48.45
7.0	21.22	17.0	33.06	27.0	41.67	37.0	48.78
7.5	21.96	17.5	33.55	27.5	42.05	37.5	49.11
8.0	22.68	18.0	34.02	28.0	42.44	38.0	49.44
8.5	23.38	18.5	34.49	28.5	42.81	38.5	49.76
9.0	24.06	19 0	34.96	29.0	43.19	39.0	50.08
9.5	24.72	19.5	35.41	29.5	43.56	39.5	50.40
10.0	25.36	20.0	35.86	30.0	43.92	40.0	50.72

In plumbing-work we cannot secure this velocity in the flow of water through pipes, because of the friction which constantly tends to diminish it. The longer the pipe, the greater the friction and consequent retardation of the flow.

TO FIND THE HEAD OF WATER, WHEN DIAMETER AND LENGTH OF PIPE, AND NUMBER OF GALLONS DISCHARGED PER MINUTE, ARE KNOWN.—In the above table the head due to a length of one yard is found opposite the number of gallons. Multiply that number by the given length in yards, and we have the required head in feet. Thus, to find the head necessary to deliver 130 gallons per minute by a pipe 4 inches in diameter, 500 yards long; opposite 130 gallons in the table, and under 4 inches in diameter, is 0.679, which, multiplied by 500, gives 339.5 feet, the head sought.

TO FIND THE DIAMETER OF THE PIPE, WHEN HEAD, LENGTH OF PIPE, AND THE NUMBER OF GALLONS DISCHARGED PER MINUTE ARE KNOWN.—Divide the head of water in feet by the length of the pipe in yards, and the number nearest to this in the table opposite the number of gallons will be found under the required diameter.

TO FIND THE LENGTH, WHEN THE HEAD, NUMBER OF GALLONS PER MINUTE, AND DIAMETER OF PIPE ARE KNOWN.—Divide the given head by the head for one yard, found in the table under the given diameter and opposite the given number of gallons, and the result is the required length.

The discharge of small pipes may be calculated with sufficient accuracy for practical purposes from the following convenient table, showing the quantity of water that will flow through a pipe 500 feet long in 24 hours, with a pressure due to a head of ten feet :—

⅜-inch bore	576 gallons.	¾-inch bore . .	3,200 gallons
½-inch "	1,150 "	1-inch " . . .	6,624 "
⅝-inch "	2,040 "	1¼-inch " . . .	10,000 "

CONTENTS OF EARTHWORK.

In estimating the number of cubic yards in an excavation or embankment, the solid contents of the earth before breaking up is taken or "measured in place," as it is commonly termed. If measurements are to be taken from a loose heap, a deduction must be made according to the nature of the soil. In ordinary soils it is the usual practice to deduct one-third or one-fourth.

SHRINKAGE OF EMBANKMENT.—[*From Trautwine's Handbook.*]—"Earthwork when first dug and loosely thrown out swells about 1-5 part, so that a cubic yard in place averages about 1 1-5 or 1.2 cubic yards when dug, or 1 cubic yard dug is equal 5-6 of a cubic yard in place. When made into an embankment it gradually subsides and settles or shrinks into a less bulk than it occupied before being dug."

The following are approximate averages of the shrinkage, or in other words, the earth measures in place in a cut will, when made into embankment, occupy a bulk less than before by about the following proportions: Gravel or sand, about 8 per cent., or 1 in 12½ less; clay about 10 per cent., or 1 in 10 less; loam about 12 per cent., or 1 in 8½ less; loose vegetable surface soil, about 15 per cent., or 1 in 6⅔ less; puddled clay about 25 per cent., or 1 in 4 less.

Trautwine further says, from trials of his own, that one cubic yard of any hard rock in place will make from 1⅔ to 1¾ cubic yards of embankment; say, on an average, 1.7 cubic yards, or that one cubic yard of rock embankment requires .5882 of a cubic yard in place. He found that a solid cubic yard when broken into fragments made about as follows:

		OF WHICH THERE WERE	
	CUBIC YARDS.	SOLID.	VOIDS.
In loose heap	1.9	52.6%	47.4%
Carelessly piled	1.75	57.0%	43.0%
Carefully piled	1.6	63.0%	37.0%
Rubble very carelessly scabbled	1.5	67.0%	33.0%
Rubble somewhat carefully scabbled	1.25	80.0%	20.0%

Excavation is measured by the cubic yard. To ascertain the number of cubic yards of excavation made, take the length and multiply the same by the width and the average height; the result will give the number of cubic feet, which divided by 27. will be the amount in cubic yards. Example:—How many yards of excavation in a cellar 15 feet wide by 18 feet long and 7 feet high? Answer: 15 times 18 times 7 are 1,860 cubic feet; divided by 27 are 70 cubic yards Trenches and pier holes double measurements are usually allowed.

TESTS FOR SLATE.

A German trade journal advocates the following method for testing the quality of roof slates: The samples of the slate to be tested should be carefully weighed, and then put into boiling water for a quarter of an hour. The water must, however, be fairly free from lime, saltpetre and ammonia. The slates are then reweighed, and those that show the greatest increase of weight are those most capable of resisting deterioration.

Cracks in floors, around the skirting board or other parts of a room, may be neatly and permanently filled by thoroughly soaking newspapers in paste made of one pound of flour, three quarts of water and a tablespoonful of alum, thoroughly boiled and mixed. The mixture will be about as thick as putty, and should be forced into the cracks with a bent knife or other handy tool. When dry it will be harder than the boards.