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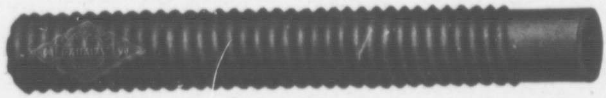

. The Central . .
Railway and Engineering Club
. . . . Club . . . .

OF CANADA

OFFICIAL PROCEEDINGS

Vol. 4 No. 9. TORONTO, CAN., December 20, 1910. $1.00 per year 15c. per copy

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PROCEEDINGS OF THE CENTRAL RAILWAY AND ENGINEERING CLUB OF CANADA MEETING.

PRINCE GEORGE HOTEL, TORONTO, Dec. 20th., 1910.

The first Vice-President, Mr. G. Baldwin, occupied the chair.

Chairman,—

We will open this meeting with the first order of business, which is the reading of the minutes of the previous meeting, and as everybody has had a copy of the minutes, it will be in order for someone to mave their adoption as read.

Moved by Mr. Jefferis, seconded by Mr. Fletcher, that the minutes of the previous meeting be adopted as read. Carried.

Chairman,—

The next order of business is the remarks of the President.

Owing to the unavoidable absence of our esteemed President, Mr. Duguid, who, I am pleased to tell you, has been recently promoted to the position of Master Mechanic of the Eastern Division of the Grand Trunk Railway, with head quarters at Montreal, consequently he is unable to be present this evening. He assured Mr. Worth he would, if at all possible, be present. However, he has not been able to connect.

I will not take up any more time with that order of business as we have got a lot of business on hand to-night, and on looking over Mr. Keith's paper I find it is quite a lengthy one, and I will, therefore, proceed with the other business.

I will now ask the Secretary to read the list of new members.

NEW MEMBERS.

F. A. Willsher, Naval Architect, Polson's Iron Works Limited, Toronto.

H. Rogers, Chief Draughtsman, T. & N. O. Ry., North Bay, Ont.

Harold W. Mole, Assistant General Storekeeper, Canada Foundry Co.

H. Eatherley, Machinist, Bawden Machine Tool Co., Toronto.

MEMBERS PRESENT.

G. Baldwin
A. W. Carmichael
J. Herriot
T. McKenzie
W. E. Adams
F. S. Ferguson
J. Adam
R. Pearson
C. Chappelle
G. F. Milne
T. B. Cole
T. C. Tinline
C. G. Herring
G. S. Grassick
F. Scott
W. Evans
W. J. Jones
A. Thompson
L. S. Hyde
F. R. Wickson
H. G. Fletcher
F. Slade
R. M. Carmichael
F. D. Dewar
W. R. Sexton
G. C. Keith
J. Jackson
W. Newman
S. G. Dabner
J. Shields
A. E. Till
V. Baker
A. T. Cowpersmith
G. Black
H. Hartley
A. Hallamore
A. Cowan
C. L. Worth
C. A. Jefferis
E. A. Wilkinson
H. Eatherley
F. Hardisty
A. Taylor
A. Woodley
P. Bain
T. B. Irving
G. P. Beswick
C. Whitlock
E. G. E. Ffolkes
E. Logan
J. F. Campbell
H. Eddrup
J. Dodds
C. Shook
R. H. Fish
J. McWater

Secretary,—

We have just four new members to-night, this is the smallest list we have had this year. I suppose they are holding back for the New Year.

Chairman,—

I might add that these members have been passed on and duly elected as members of the Club. I will now pass on to the order of business in reference to reports of Special Committees. I think Mr. Fletcher has got something to say in connection with this.

Mr. Fletcher,—

Under this order of business I might say that a Special Committee was appointed for the purpose of securing permanent quarters for this Club so that they would be able to hold their meetings in a room set apart for this purpose so that we would not be dependent on any one and could say definitely that our meetings would always be held on a certain night, and not find ourselves in the position we were in last month of having to postpone the meeting for a week on account of this room being used by some other Society.

The Committee took this matter up with the Engineer's Club, and a reply has been received stating that at the present time they are not in a position to give us a definite answer to this matter; in other words, they cannot tell us absolutely what night in each month we can be certain of using their lecture room.

I presume a great many of our members know that this Engineer's Club embodies Civil Engineers, Mechanical Engineers, Railroad Engineers and Stationary Engineers

We do not really know what they have to offer us, and until we receive a definite report from them stating what night would be set apart for us, the terms, etc., nothing definite can be decided upon.

I have, with Mr. Bannon and Mr. Wickens, gone into this matter most carefully, and we have done our best to get the best possible arrangement in connection with this matter, and for the present the matter will have to lie in abeyance until we receive a report from them.

Chairman,—

You report progress then?

Mr. Fletcher,—

Yes, we report progress.

Chairman,—

The next order of business is unfinished discussions of papers read at previous meetings.

Mr. Newman,—

In a recent edition of the *Canadian Engineer* exception was taken to the statement made by Mr. Hacket in his paper on "Railroad Signalling" read before the Club two months ago, in which he stated that the objection to the White crossing signal was that both the bell and the visual signal were worked from the same battery, so that if anything went wrong with the bell the light would also be out of business. The writer of the article pointed out that this was not the case, and that the bell and the visual signal were worked independently of each other and I think that this matter should be recognized in the next issue of our Journal.

Chairman,—

We must get the Secretary to get in touch with Mr. Hacket in reference to this matter.

The next order of business is the reading of papers or reports and discussion thereof.

We have with us to-night Mr. Keith, who is one of our prominent members, who takes a great deal of interest in our

Club. He is a regular attendant, and he has gone a step further than that and has prepared a very lengthy and very interesting paper. I have read the paper through and there are many things in it which I am sure will be of great benefit to the members, especially to the machinists. Without any further remarks I will call on Mr. Keith.

We have a few copies of cuts in connection with this paper, and I will ask the Secretary to distribute them amongst you.

MODERN MACHINE TOOL PRACTICE FOR MAXIMUM PRODUCTION.

By GORDON C. KEITH, B.Sc.,
Managing Editor *Canadian Machinery*, Toronto.

Since the introduction of high speed steel and motor drive there has been such a revolution in machine tool design that it is only now that the present status of machine tool practice may be definitely defined. A complete redesign of machine tools has been necessitated and all the changes made and new methods adopted have had the one object in view, viz., that of obtaining maximum production.

The starting point in obtaining maximum production has been the proper care of tools. In a number of Canadian shops it has been recognized, as it has also been in the United States shops, that a central tool room with a man in charge is a large factor in securing maximum production. The shapes and sizes of lathe tools, boring cutters, chisels, the method of forging and treating the tools should be standardized as should also all shop equipment, clamping bolts, wrenches, etc. Even in the smaller shops, such as that of the Toronto Street Railway and other railroad repair shops, it has been found to pay to have one man grinding all the tools and have charge of the tool room. All carelessness with tools and ignorance in the selection of tools for certain work is eliminated by having the tools prepared and selected in advance, and kept in good shape, thus assisting in securing maximum production.

Probably the best illustration of a central tool room is that of the United States Navy Department, located at League Island, Philadelphia, Pa., for supplying the Atlantic Coast Navy yards. Standard chemical and physical specifications for high speed steel have been adopted. The plant has a capacity of 800 tools per day, and consists of a forge shop, treating department of chemical and physical test, together with the apparatus necessary for producing standard tools of the highest quality at minimum cost. Tools are made in such quantities as to ensure economical manufacture, and are carried in stock.

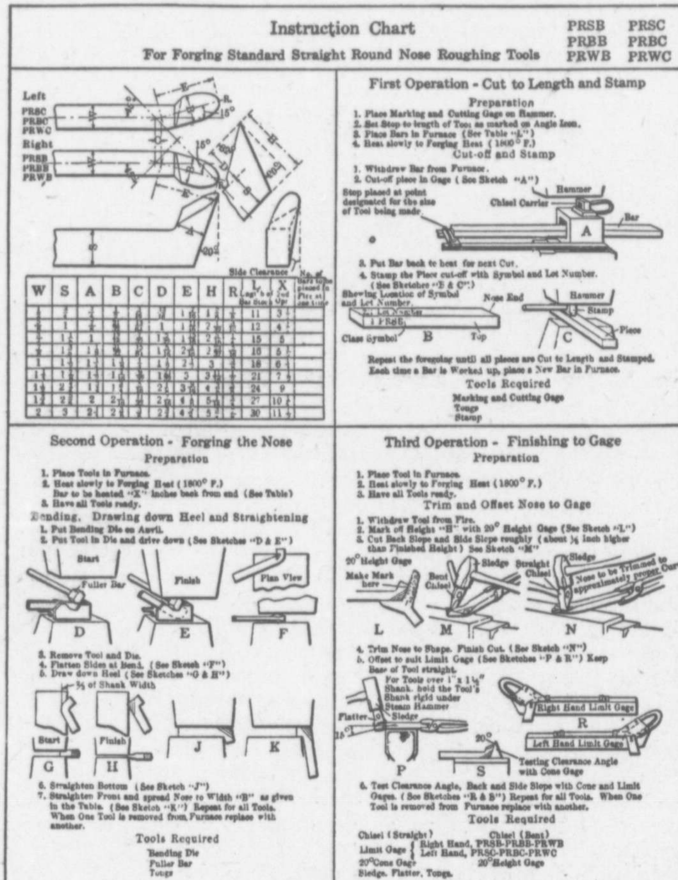

FIG. 1

The apparatus necessary and the methods of using it as followed in the forging plant, are compiled on instruction charts, one of which is shown in Fig. 1. This covers the forging of straight round-nose roughing tools, right or left hand, giving the necessary dimensions and graphic instructions for using the appliances.

The enormous railway mileage in Canada and the United States has resulted in great advances being made in railway shop equipment and a statement of what is being accomplished with modern machine tools and high speed steels in the shops should prove of interest. A few years ago six pairs of car wheels per day was the maximum production. Machine tools have since been brought to a constantly high state of efficiency until the best lathes, of five years ago, averaged about twelve pairs per day. Within the past two or three years this output has been steadily increased by improvements in design and methods of handling until the present time many railroads are equipped with lathes turning out from sixteen to twenty pairs of 36-inch standard make wheels in ten hours.

On May 11, 1910, a detailed record was kept on tire turning on a wheel lathe at the West Albany shops of the New York Central & Hudson River Railroad. It will be noted in Fig. 2, that thirty-three pairs of 36-inch wheels were turned in 9 hours and 53 minutes, being an average of 17 minutes and 58 seconds per pair.

Wheel lathes were gradually increased in weight and power until it was finally found that the wheels and axles themselves were the weak point in the turning operation. Recognizing this fact Small & McNaughton brought out, twenty years ago, a design of a machine to overcome this difficulty. This lathe was at that time a radical departure from ordinary design. The turning of axles on centres was abandoned, the entire axle journal being received in the head by means of a split bush made to fit the axle and having its exterior turned taper. This eliminated the obvious weakness and hence springing of the center and its projecting spindle. It held the axle rigidly close up to the wheel. The old form of wheel lathe was driven from one end and the power carried across the machine by a long shaft. This put an inevitable amount of torsion and lack of rigidity between the point at which the power was applied and the wheel to be turned at the other end of the axle, and it was found to be one serious source of vibration and chatter. So to overcome this difficulty the Small & McNaughton design was driven by a large spinal gear in the centre, having a gap through which the axle could be rolled. The power from the large central drive was furnished to each wheel through face plates. The outside spindles supporting the axle were also provided with face plates and chucks, hence the wheels were clamped rigidly between two staunch face plates driven from one and chucked by the other; thus the wheels were held with absolute rigidity and became, in fact, one with the machine itself.

DATA OF TEST OF NILES-BEMENT-POND CAR-WHEEL LATHE.

Pond 42-inch motor-driven car-wheel lathe

At West Albany Car Shops, N.Y.C. & H.R. R.R. 36-inch Krupp and Paige Wheels,

May 11, 1910.

Continuous Run from 7 a.m. until 5.53 p.m., one hour for nooning.

Pair No.	1	2	3	4	5	6	7	8	9	10	11	Average.
Putting in lathe	3	2	2	3	2	2	2	3	2	3	2	2 min., 28 sec.
Roughing	11	8	9	9	9	9	9	9	11	10	10	9 min., 23 sec.
Finishing	5	6	4	3	5	4	6	4	7	5	5	5 min., 7 sec.
Taking out	1	1	1	1	1	1	1	1	1	1	1	1 min., 0 sec.
Time from floor to floor	20	17	16	16	17	16	18	17	21	19	18	17 min., 58 sec.
Depth of cut	¼	⅛	3/16	¼	3/16	⅛	⅛	3/16	3/16	¼	3/16	3/16 inch.
Feed	13/32	13/32	13/32	13/32	13/32	13/32	13/32	13/32	13/32	13/32	13/32	13/32 inch.
Speed	16	16	17	15	14	12	13	18	12	14	15	14.4 feet.

Pair No.	12	13	14	15	16	17	18	19	20	21	22	Average.
Putting in lathe	2	4	2	2	2	4	3	2	2	3	3	2 min., 28 sec.
Roughing	9	11	12	8	9	8	10	8	9	9	11	9 min., 23 sec.
Finishing	5	5	8	4	5	4	6	7	5	5	6	5 min., 7 sec.
Taking out	1	1	1	1	1	1	1	1	1	1	1	1 min., 0 sec.
Time from floor to floor	17	21	23	15	17	17	20	18	17	18	21	17 min., 58 sec.
Depth of cut	⅛	3/16	½	⅛	3/16	3/16	⅛	¼	¼	3/16	3/16	3/16 inch.
Feed	13/32	13/32	5/16	13/32	13/32	13/32	3/32	13/32	13/32	3/32	3/32	13/32 inch.
Speed	15	13	10	14	12	15	11	12	10	14	12	14.4 feet.

Pair No.	23	24	25	26	27	28	29	30	31	32	33	Average.
Putting in lathe	2	3	2	2	3	3	3	3	3	1	1	2 min., 28 sec.
Roughing	9	11	9	10	7	10	9	10	10	7	10	9 min., 23 sec.
Finishing	5	6	5	6	5	6	5	4	3	5	5	5 min., 7 sec.
Taking out	1	1	1	1	1	1	1	1	1	1	1	1 min., 0 sec.
Time from floor to floor	17	21	17	19	16	20	18	18	17	14	17	17 min., 58 sec.
Depth of cut	¼	3/16	⅛	⅛	3/16	¼	3/16	3/16	⅛	3/16	¼	3/16 inch.
Feed	13/32	13/32	13/32	13/32	13/32	13/32	13/32	13/32	13/32	13/32	13/32	13/32 inch.
Speed	14	13	11	14	20	15	17	17	16	21	18	14.4 feet.

Average time for turning, 17 min., 58 sec Total time for 33 pairs, 9 hours, 53 min.

FIG. 2.

On a modern wheel lathe no attention is paid to the hard skin of the tire caused by friction of the wheels and brake shoes, for the simple reason that the tool is put directly under this scale and a heavy roughing cut can be fed across in eight or nine minutes. After that, a finishing tool is used the full width and shape of the tire and fed directly in without any use of cross-feed, a third tool the shape of the flange finishing the operation. The increased output of modern lathes, comes from their great weight and power and improved facilities for handling and getting the wheels in and out of the lathe, and from the higher quality tool steel.

After the capacity of the wheel lathe got up to twenty or more pairs of wheels a day, the manual labor of clamping and unclamping the cutting tools became quite a serious matter for the operator, and a number of devices have been brought out to lighten and quicken this operation. The limit of human endurance comes into the problem and here clamping and unclamping, if it had to be done with a wrench on say twenty pairs of wheels per day, it would mean 350 to 400 manipulations in ten hours.

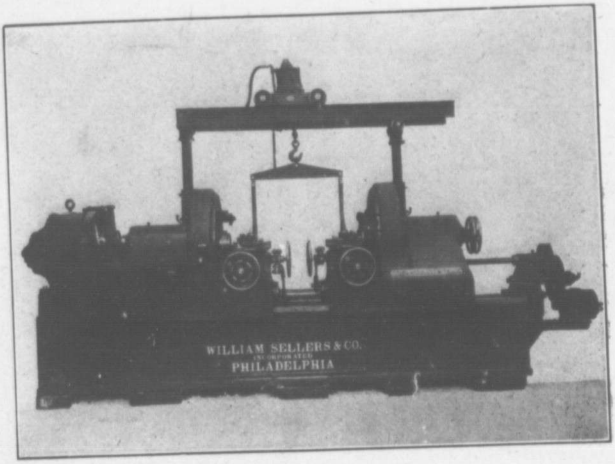

FIG. 3

One device that has been brought out is in the form of a turret tool-holder which has the roughing and finishing tools set in it, the holder being rotated to bring the various forms into action.

Another device is a pneumatic clamp by which the operator simply opens a compressed air valve and clamps his tool by power. In this arrangement the air cylinder is built in the body of tool rest; the piston carries a wedge which, operating between two rollers, forces up the long end of the clamping lever. Thus, the operator is relieved from several hundred strenuous muscular exertions, leaving him more efficient to attend to the actual turning operations.

Recently a 42-in. car-wheel lathe was developed in the United States which illustrates what certain machine tool builders are accomplishing in the way of production in the railroad shop. It has been pointed out above, that a few years ago ten pairs per day was considered a good record. The rate has been constantly increased until an average of twenty minutes per pair has been obtained. This exemplifies the economies in railroad shop machine tool practice that have recently been brought about. See Fig. 3.

For the test of this lathe three pairs of 36-inch steel-tired wheels, selected at random from a large number shipped to the machine builders' plant by the Reading Railroad Co., were turned in an average of about 20 minutes per pair, including setting machinery and taking out of lathe. The actual time that the machine was in operation averaged about 18 minutes per pair, and 90 per cent. of the total time required represents the period that the machine was doing effective work.

FIG. 4

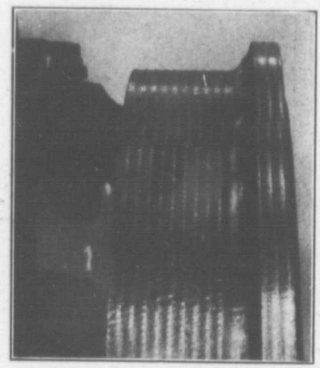

FIG. 5

The cut and feed during the test was $\frac{3}{8}$-inch each, taken at a speed of from 15 to 19 feet per minute. The time taken from floor to floor of a pair of wheels, as well as the other details of the test, are given in the following table.

	No. 1.		No. 2.		No. 3.		Engine truck wh'ls.	
Diam. wheel finished...	34⅜ in.		34 3-16 in.		34 11-16 in.		30⅝ in.	
Diam. Wheel rough...	35⅛ in.		34 15-16 in.		34¼ in.		......	
	Min.	Sec.	Min.	Sec.	Min.	Sec.	Min.	Sec.
Floor to chuck.....	1	5	2	6	1	18	1	2
Turning...........	17	8	16	2	18	17	13	55
Machine to floor....	1	2	1	17	..	50	..	4
Total time	19	47	18	45	19	85	15	15
Cutting speed ft.min	15	and	16	16	..	14	..	19

Time to change from turning tender to engine truck wheels, 6 min. 1 sec.

The operation of the machine during these tests was in the hands of William Anthony of the Reading shops of the Philadelphia and Reading Railroad.

In these tests the final finish was remarkably fine. There was not a trace of chatter to be found, and the surfaces of the treads were free from those fine cracks, extending down into

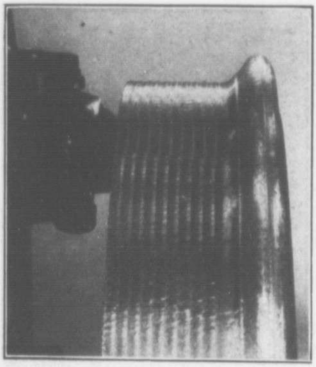

FIG. 6

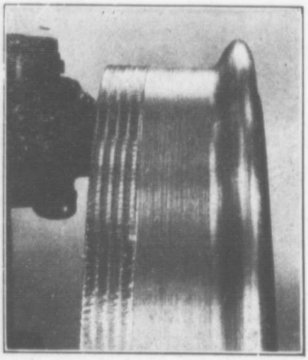

FIG. 7

the metal that are so characteristic of surfaces from which metal has been removed in heavy cuts at high speeds. The reproductions of photographs of these surfaces taken first after roughing and then after the finishing cut, show the effect very clearly. Fig. 4 is a worn wheel taken from service, mounted in the chuck. Fig. 5 shows the first operation completed. In Fig. 6 the next tool has roughly formed flange, and taken off large corners. Fig. 7 shows condition of wheel at the end of cut of third tool. Fig. 8 shows the wheel ready for service.

The method of procedure is the usual one. The wheels are set in position and the roughing tool made to take a cut across the tread and top of the flange. The tread and flange tool is then forced in, taking a broad smooth cut, and leaving the surface in excellent condition, already noted. Then comes a similar tool for cutting the taper at the outer edge of the taper and round the corner of the rim. This done, the wheels are finished.

The car wheel is driven by a motor set down on the extension of the bed. The lathe is an example of the application of individual motor drive to machine tools. Exhaustive tests have been made so that the machine tool builder has now no difficulty in selecting the proper power of motor for machining various materials for various combinations of speeds, feeds,

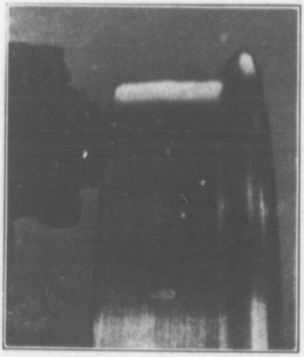

FIG 8

and depth of cut. Individual motor drive has been adopted in a large number of railway shops, machines of smaller capacity being arranged in groups and driven from a line shaft by one motor.

The high power wheel turning lathe for locomotive driving wheels shown in Fig. 9 is a result of the makers of machine tools trying to raise theii capacities up to the cutting possibilities of high-speed steel. The lathe shown has a swing of 90 inches. It is estimated that when the tool is cutting $\frac{3}{8}$-in. deep with $\frac{1}{2}$-in. feed, the pressure at the point is about 55,000 lbs. Such a cut is readily made at a speed of 16 feet per minute, which requires 880,000 ft. lbs. per minute or nearly 27 h.p. at the point of the tool. To do this and avoid chattering the machine has been rigidly constructed. The device is obtained by means of dogs fastened at the rim or tire. The dog has a gripping shoe "A" shown in Fig. 11, and the pointed arm has a set screw "B." The arm swings up between the spokes of the wheel and the two grips come in line with the two faces of the tire. The set screw "B" is then turned in with a heavy wrench until its point has penetrated the metal and the shoe "A" has a firm grip. This shoe "A" is held in line and in place by the sides of the holding bracket, but the set screw "B" has a slight swinging motion. When the lathe is started, the shoe "A" drives the wheel through the tire, but if there be any slip the set screw "B" hangs back with the tire and in so doing gets out of alignment with "A." The slotted hole in the dog makes this possible, and as this lessens the distance between "A" and "B" the former is drawn into

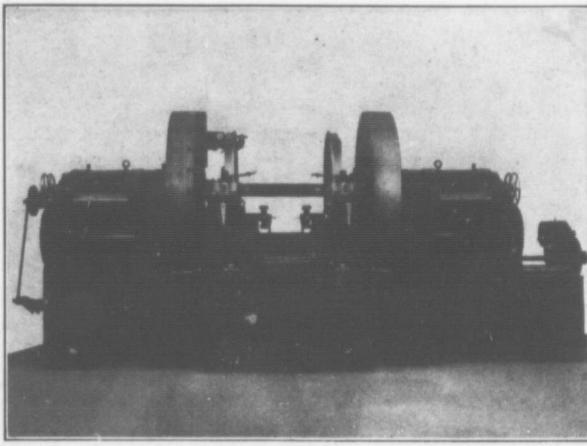

FIG. 9

the metal of the tire, tightening the grip. When this grip exceeds the thrust of the tool, the tire will turn and the cutting proceed. Fig. 10 shows wheel in position. Fig. 12 shows a roughing cut being taken. Fig. 13 are the tools used for turning tires on the wheel lathe shown in Fig. 9.

A turret tool holder has been substituted for the tool post. The turret can be easily and rapidly turned and the successive tools brought into action.

In testing the lathes, the cutting was limited to a speed of 13 ft. per minute, with a cut and feed of ½-in. but it can be speeded to 25 ft. per minute and remove the same amount of metal, but the high speed steels will not stand the strain and heat. With a ⅜-in cut and ½-in. feed the tool and the metal it is cutting, are at a red heat at the point of contact.

A demonstration was recently made in which the lathe was set complete for turning wheels of 78 inches diameter with $6\frac{1}{4}$ in. tires in 12 minutes, including the placing of the wheels in position for work. They were then finished complete in 19 minutes and placed on the floor in four minutes more. The total time from floor to floor, including the setting of the lathes, was 35 minutes. This work was the same as the turning off of a new set of tires and the cut was but $\frac{1}{8}$-in. deep.

In another test, a pair of 67 inch wheels with $6\frac{1}{4}$ in. tires, were chucked in 7 min. turning complete in 28 min., and put

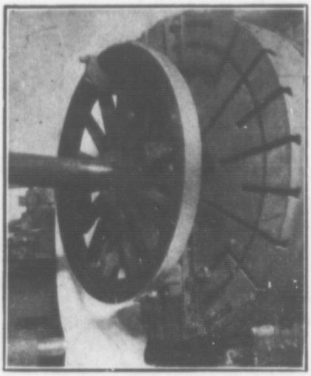

FIG. 10

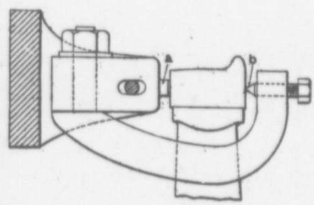

FIG. 11

on the floor in 3 minutes more, or a total of 38 min. from floor to floor. In this case the cut was $\frac{3}{8}$-in. deep.

A third test was made with 67 in. wheels and $6\frac{1}{4}$ in. tires. They were chucked in 9 min. and finished in 43 min., the breaking of a tool having delayed the work four minutes. The work was done at a cutting speed of from 13 to 15 ft. per min. When a tool steel is produced that can stand the stress and heat of a higher speed no doubt there will be a greater output than modern machine tool practice will allow.

The automatic nut-tapping machine illustrates one phase of modern development in machine tools to secure maximum production. In this machine the only attention required is for the attendant to drop the nut blanks into the hopper. One of these machines, in the Schenectady works of the American Locomotive Co., operated during a week's run at the rate of 12,000 half inch nuts in ten hours, and in the same period of time 10,000 $\frac{5}{8}$-in. nuts.

The straught or taper bolt turning machine has a practical every-day production of 1,762 $\frac{3}{4}$ to $\frac{7}{8}$-in. taper bolts 4 inches long, in 10 hours (spindle speed, 75 revloutions and 5-32-inch feed per revolution), and 304 two inch bolts 16 ins. long in the same time (spindle speed 40 revolutions and feed 5-32 in. per

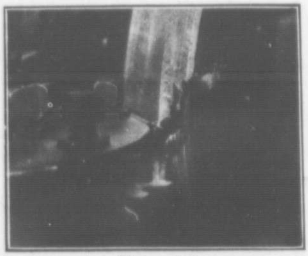

FIG. 12

revolution). This production is secured by roughing on two spindles and finishing on two others.

Fig. 14 illustrates work done on a Universal Grinder, which is built for use in the railroad tool room or repair shops. This grinder grinds reamers, gauges, dies and boring bars, does straight or taper, external or internal grinding, and handles a large variety of grinding on small parts such as knuckle pins, and cross head pins, link blocks and plates,

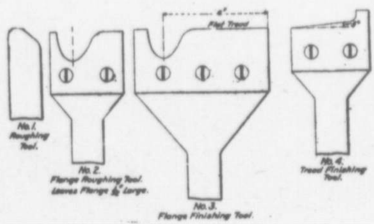

FIG. 13

parts of air valves, etc., with speed and accuracy. The Gap grinder is also a railroad tool, a gap along the bed adapting it to a variety of work and permits grinding accurately and economically worn or turned piston rods, valve yoke stems, axles and other parts. A crane may be attached for handling axles, piston rods and other heavy work.

At the convention of the American Railway Master Mechanics' and Master Car Builders' Association at Atlantic City last June, a heavy duty drill was exhibited that was of unusual interest, not only because of its constructural features, but also by reason of the results in the way of rapid drilling which it makes possible. An improvement which tends to increase the usefulness of the tool is the new compound table.

As will be noticed from Fig. 15, this table is very different from the ordinary type and is a valuable adjunct to the machine The table has a working surface of 16x30 in. and is provided with a rapid movement of 20 in. longitudinally and 8 in. trans-

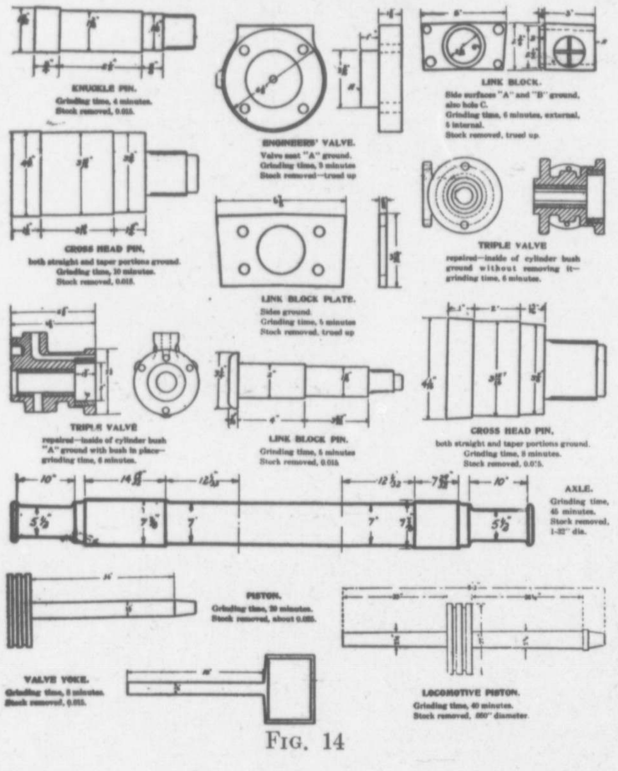

FIG. 14

versely through worms and racks. The operator standing directly in front of the table can manipulate it forward or back or longitudinally without moving from his position. Springing is eliminated, and the table is supported by a heavy bracket or knee underneath and an elevating screw as well, which it is claimed prevents the slightest spring. A very quick adjustment is obtained with this table. A large chip pan is provided at each end, as well as an oil groove running lengthwise at each side, arranged so that all the lubricant running into the chip pan at the farther end is drained back through a cored opening in the table to the pan nearer the supply tank.

The machine is built on the unit system, that is, the speed changing mechanism is in one separate box, the feed change gears are enclosed in another separate case, and the head is a third unit entirely independent of the other parts.

In a series of tests made using high speed twist drills, cutting speeds as high as 200 ft. per min. in cast iron were obtained, although 125 to 150 ft. per min. were used in most

FIG. 15

cases, which was undoubtedly due to the fact that the nature of the work was the limiting factor rather than the drill or the machine itself.

Fig. 16 shows a modern Canadian made 90 inch wheel lathe installed in the G.T.R. shops at Stratford.

The face plates are very heavy and massive, 91 inch diameter, and have bolted to them an internal gear of wide face and coarse pitch. The spindles are massive, all bearings being 16 inch diameter by $22\frac{1}{2}$ inch long, scraped accurately to a bearing and ample lubrication is afforded for these bearings.

The gearing is all of ample size and strength for the work required. The pinions under stress are all of steel, and all gears are cut from the solid on accurate gear cutting machinery. The construction of the drive is such that the long bottom shaft is relieved to a considerable extent of the heavy torsion which invariably causes chatter on this class of machinery. Clutches and change gears are provided, giving a wide range of speeds for all wheels from 34 inch to 84 inch on the tread. The rests are exceptionally massive, having power feed across the tread, varying from 4-25-in. per revolution to 12-25 in. per revolution. The feed mechanism is of the link type, designed so as to give 8 impulses of feed per revolution of the face plate. The bottom rests are moved along the bed by means of rack and pinion, and have extension to allow the cross rest to

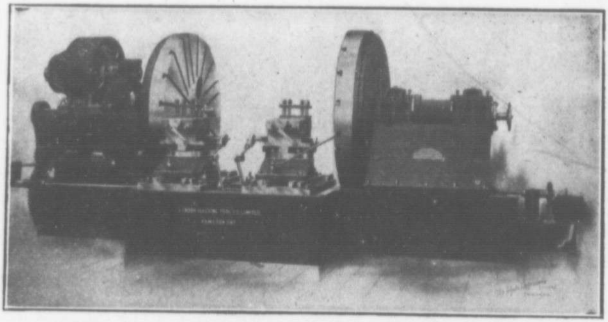

FIG. 16

move in sufficiently close for small wheels. The left hand is driven in and out by means of reversing pulleys acting through gears into a screw placed under the centre of gravity of head.

The drivers on this machine consist of four sets of adjusting steel blocks, having serrated edge gouging into the outside of tire. Powerful bolts are provided for slipping through the arm of the wheel, and drawing the wheel back against the face plate. This makes the wheel practically one with a heavy face plate, giving great rigidity. On a machine with this drive cuts 1 inch deep, and 7-16 inch feed have been taken.

All high speed shafts run in babbitt or bronze bearings, on the lower speed shafts, in cast iron bearings. These were adopted after considerable experimenting.

The weight of this machine complete is 102,000 lbs. The largest piece of bed is 22 ft. long by 8 ft. wide, and weighs about 28,000 lbs. This machine is driven by a 50 h.p. motor, 220 volts, D.C. Westinghouse make, 500 to 1,000 r.p.m., also 1 5 h.p. Series Motor, 220 volt, Westinghouse.

In the design of the traveling head slotter, Fig. 17, the experience of many of the largest users of slotters in the country, particularly in railroad shops where the heaviest service is required have been taken into account. Weak spots have been eliminated, many conveniences have been added, simplifications made in construction, and an excellent machine produced. The essential features in design are the movable head and the quick power adjustments to head and to all motions of table. Coupled with these are the minor improvements

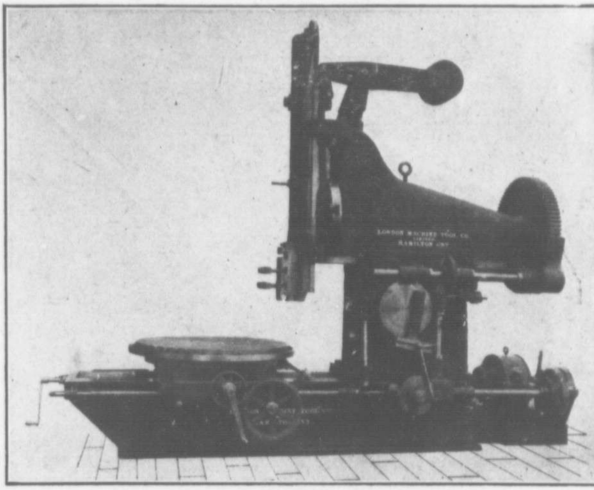

FIG. 17

of extra quick return of ram, stroke indicator, automatic throw out to feed, etc.

The traveling head is the striking feature of this machine, and its great value is very apparent, especially on massive jobs where the work cannot be readily moved. This construction also makes it possible to do work requiring a great reach. This construction at first hand is criticized on account of the spring of head under heavy work. In actual practice this spring is found to be very small, owing to the fact that the upward thrust is taken by two massive long bolts running clear through and anchored in base, and also the column is made very deep and heavy and the head being well scraped thereto makes spring practically negligible. Moreover when the head is close back to the column the maximum stiffness of slotter construction is reached.

The quick power adjustment to head and table can be thrown in and out, while the head is running or standing, as desired. The quick power feature on certain classes of work means an increase of 200 p.c. in output. By this feature, as a general proposition, this machine will do 50 p.c. more work than was formerly possible. The quick return is of special construction giving remarkably even cutting strokes with very fast return. An indicator is attached showing amount of strokes.

The feeds have a wide range and are operated without

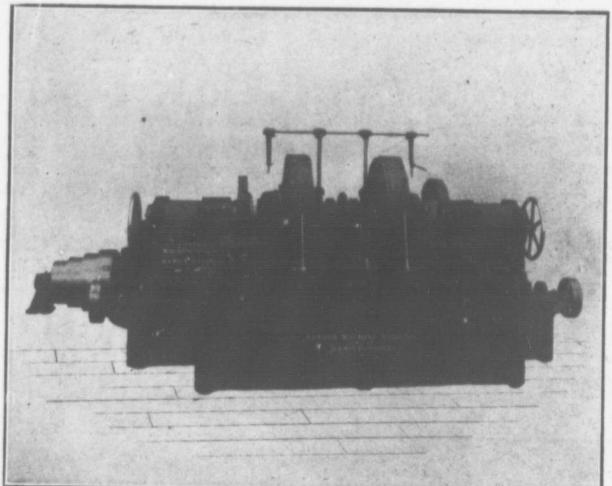

FIG. 18

cams, are adjustable and reversible, while machine is in operation. A safety device automatically throws out feed in case of any obstruction.

The table is large and of heavy pattern, and clamped by means of four corner bolts. Circular table is graduated to degrees. Cross slide and bottom slide are of large size, and accurately scraped and gibbed to place. Cutter bar has square bearing in guide, to which it is carefully scraped. It is conveniently raised and lowered by crank handle working into screw. It is provided with relief apron hinged to ram.

The gearing is all of extra wide face and coarse pitch cut from the solid, making it possible to take enormous cuts at high speed. All shafting is carefully turned and ground and made of special high carbon steel.

The machine is arranged for belt or motor drive. When motor drive is used, 3 to 1 variable speed motor is used.

SPECIFICATIONS.

Maximum stroke	24½″
Will cut to the center of circle	7′ 6″
Will cut to the outside of circle	9′ 2″
Diameter of table	4′ 6″
Distance table to head	2′ 5″
Adjustment of ram	2′ 8″
Strokes per minute	7 to 34
H.P. of motor used, 3 to 1 var	10
Countershaft pulleys	24″ x 6″
Speed of countershaft pulleys	200 r.p.m.
Weight	32,000 lbs.

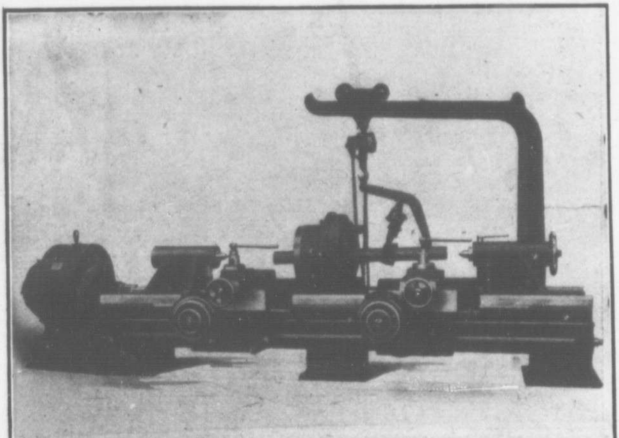

FIG. 19

The 42-inch coach wheel lathe shown in Fig. 18 is of an extra heavy type, designed for turning out railway coach wheels at a maximum rate.

The driving mechanism consists of two face plates, 56-in. diameter, and having open cut in same on one side, to admit of axle, each driven by an internal gear of steel. The spindle is 16-inch diameter, and has two bearings 14-inch long, accurately scraped. Spindle is open on one side to admit the largest axle required. The peculiar construction of this machine relieves the spindle of all torsion. Bearings on machine are bronze bushed. The pinions meshing into the internal gear are of steel, the teeth being all cut from the solid. The bearings supporting these gears are of phosphor bronze, and are 5⅞ inches diameter by 11 inches long.

The centre head supporting the two internal gears, has a wide bearing on the base, and it secured to base by heavy bolts and dowels, making an exceptionally rigid construction. The method of taking insert is very simple, there being merely two screws to loosen up, and the section driven out. On account of the shape of the gear ring it makes an exceptionally rigid construction, by which there is no vibration. To the face plates are secured drivers of the latest approved form, giving ample driving capacity to the machine.

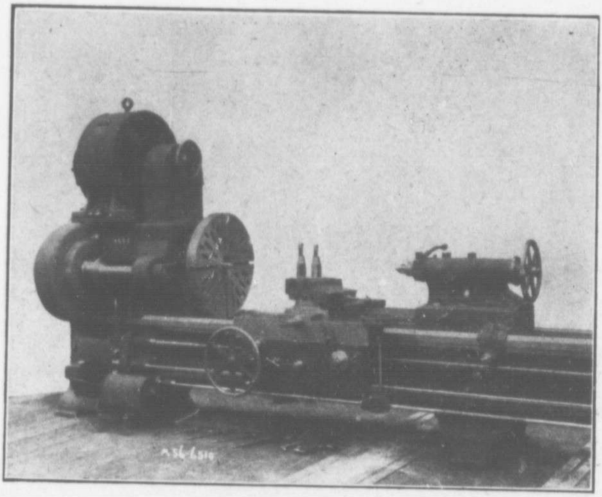

FIG. 20

The tailstocks have spindles of large diameter, to which are secured very powerful self-centering chucks for gripping the wheels. The heads are adjustable in and out for a distance of 12 inches, and are opened by means of screws operated by motors on each end. These motors do not require to be over 2 h.p. capacity each.

The cross slides and rest are extremely massive, and are provided with means for quickly releasing tool and securing it in position. $1\frac{1}{2}''$ x $3''$ tool steel should be used.

The feeds are 4 in number, and vary from 3-25ths to 12-25ths of an inch per revolution, which is ample for the work required. The base is stiff and deep, with ample foundation for bolting work to foundation.

The advantage of this machine is that the power is transmitted entirely through the gear, and bearing has only a steadying action—it has no transmitting function.

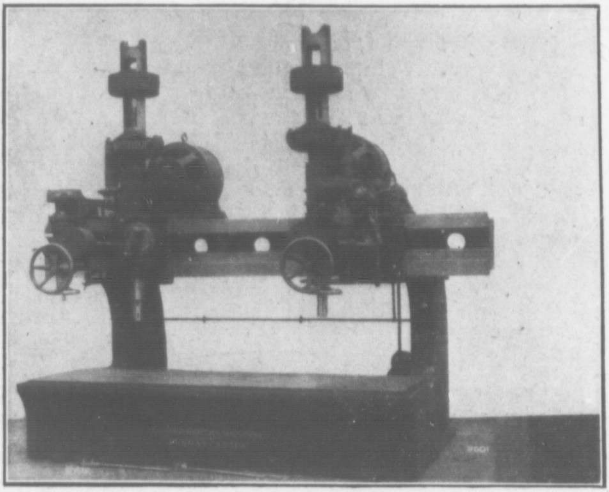

FIG. 21

The heads are moved backwards and forwards by power which relieves the attendant of much incidental trouble.

The tool post is of a very powerful type, and is operated by large screw of coarse pitch and having differential threads and requiring a minimum of energy and friction.

The weight of this machine is 45,000 lbs. For driving this machine a 40 h.p. variable speed motor, speed variation 3 to 1, is used.

The double axle lathe shown on Fig. 19 is a very heavy and powerful machine, designed for the rapid turning of car and locomotive axles. The bed is of extra width and depth, and is strongly reinforced by heavy ribs. The tailstocks, of which there are two, are of extra stiff construction. One spindle is adjustable, having a traverse of 6-in. Spindles are $4\frac{7}{8}$ in. diameter. The carriages are of the double type, having steel gearing and automatic throwout. The apron is driven by means of large rod of large diameter working through gearing into steel rack of coarse pitch and wide face. There are three changes of feed instantly obtained without stopping the machine. These feeds can be varied within wide range if desired. The center driving head has an opening of 13 inch diameter, and is driven by powerful gears of wide face and coarse pitch, and is provided with equalizing drivers

The gearing is all cut from the solid, all pinions being of steel. The shaft is of high carbon steel accurately turned and ground. For motor drive, a variable speed motor having a speed variation of 3 to 1, of from 15 to 30 h.p. depending on the class and quantity of work required, is used. If belt driven, this machine is driven by a 6-inch belt, having 3 step cone of large diameter, cone being 24 inches.

SPECIFICATION.

Weight of machine, complete	17,000 lbs.
Total length of bed	14′
Width of bed	28″
Depth of bed	$19\frac{1}{2}$″
Takes between centers	9′ 4″
Swings over cross slide	12″
Opening in head	13″
Dis. Feed rod	$1\frac{3}{4}$″
C.S. pulleys	24″ x 6″
Speed	400 r.p.m.

Fig. 20 shows a 30 inch double back geared high speed Canadian make engine lathe, built for use in locomotive work. It admits 15 feet between centres. The swing is 32 inches over shears, and $20\frac{1}{2}$ in. over the carriage. It is equipped with independent rod and screw feeds, power cross-feed, compound rest, plain tool block, quick change screw cutting gear from steel and two steady rests. It is driven by a 10 h.p. motor and has a speed of 400 to 600 r.p.m.

The back gears are on the front of the lathe and are really front gears. It is, therefore, no longer necessary with such a lathe for a mechanic to turn the tool upside down on the back of the lathe to make a good cut. The front gears act directly on work giving smooth cut. This feature is typical of modern practice.

The two spindle drilling machines shown in Fig. 21 has spindles 3 inch in diameter, with $18\frac{1}{2}$ in. traverse and three changes of speed. The heads are adjustable along the rail by hand or by power. The saddles are adjustable in and out

24 inches. The table is provided with a trough for collecting drill fluid which drains to pump for circulating. The range of spindle speeds is from 20 to 180 r.p.m. Heads and pump are motor driven.

Fig. 22 shows a modern four-head drilling machine such as used in the modern locomotive shop for drilling locomotive frames. Three heads are used for vertical drilling and one swivels for angular drilling. Power is transmitted to the head by driving shaft the entire length, which in turn is operated by a belted 20 h.p. constant speed motor driven countershaft at the end of the machine. Spindle ends are fitted for No. 5 Morse taper sockets. The table is 30 inches high by 32 ft. 2½ inches long, with three tee slots, and a top working surface of 24 inches wide by 31 ft. 8 inches long with

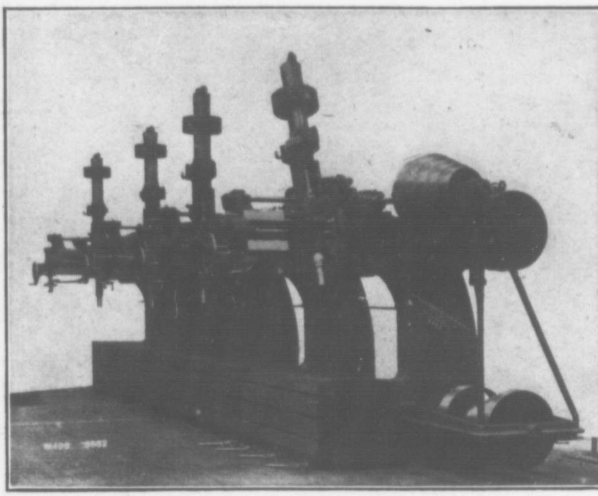

FIG. 22

cross tee slots 8 inches centers. Spindle speeds are 48 to 192 r.p.m. Maximum distance between end spindles is 30 ft. Greatest distance spindle to table is 36 ins. The spindles have horizontal traverse on their arms, their centers projecting over vertical surface of table 9 inches as a maximum. Greatest distance between column and spindle is 44 inches. The table is provided with draining trough which collects the cutting fluid and delivers same to tank at the rear. At lower tank is a circulating pump driven by an independent ¼ h.p. motor for forcing the fluid to the drill points. The gearing throughout of this drill is made of steel or bronze.

Two plans are adopted for machining reversing links. The slotter for this work is shown in Fig. 23, and a planer attachment for giving the links the correct curve is shown in Fig. 24. The slotting attachment is used on a 12-inch heavy slotting machine. The table is 30 inches in diameter with 30 in. longitudinal and 24 inch transverse speeds. When used for slotting links the worm gear is unhitched and the table rotates. The device shown for planing links makes a perfect link. The construction of the jig will be readily seen from the illustration.

Fig. 25 shows a modern horizontal milling machine for

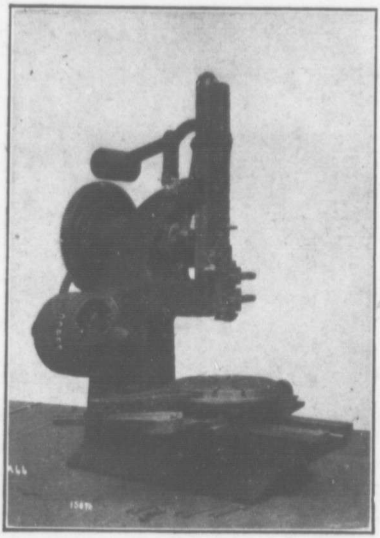

FIG. 23

milling the channels and plates on side rods. In the machine shown the distance between housings is 40½ in. The maximum distance from center of spindle to table, 52 ins. Capacity to mill 14 ft. long. The spindle is 5½ ins. in diameter, and has four changes of speed, fitted with taper socket 3½ ins. in diameter at its large end. The bed is 28 ins. wide on top and 26 ins. deep. Uprights are 44 inches deep at the base and have a 10 inch face. Crossrail is of box section 8 inch deep with 20 inch face, and is raised or lowered by hand or power. Table is 37 inches wide on its working surface and 8 inches deep above the bed, with a pan around it for catching lubricant used in cutting. The table has infinitesimal graduations in feeds by friction discs and rapid movement by power in either direction. It is motor driven by a 25 h.p. Westinghouse motor, shunt wound, speed 250-1,000 r.p.m.

Fig. 26 shows a 100 in. new model Canadian make driving wheel lathe with a capacity for 86 inch wheels. The swing over the bed is 102 inches. Maximum distance between centers is 9 ft. Swing over the carriage is 96 inches. On the

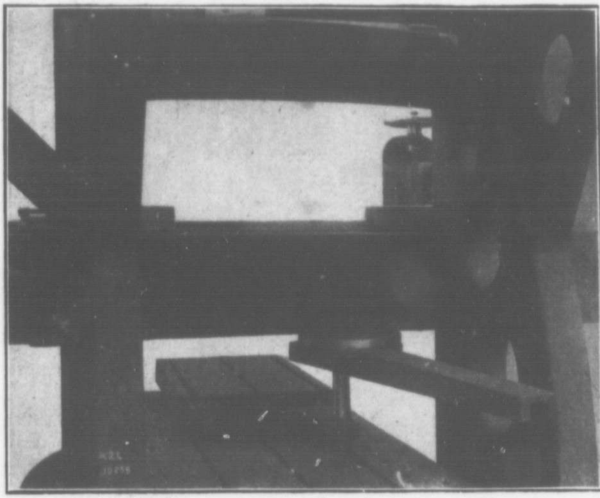

FIG. 24

pedestals are mounted two compound rests with tool blocks fitted with a patent single screw tool holder. The feed mechanism gives four changes of feed to one revolution of drive. Driving pinions are steel cut from the solid. The face plates are provided with pockets, to receive crank pins and each is equipped with four Teas' Patent Sure-grip Drivers.

Tailstock or movable head provided with quick power traverse by 7½ h.p. motor. Carriages are of box construction and extend the full width of the bed so that pedestals carrying tool blocks will have sufficient travel for boring wheel centers. When turning full diameters the rear portion of the saddle is detached which will permit wheels being taken out of the machine without changing the position of the carriage, it being only necessary to remove the tailstock to the rear sufficient to withdraw the crank pins from the face plate. It is motor driven by a 50 h.p. D.C. variable speed motor 500-100 r.p.m. with a $7\frac{1}{2}$ h.p. A.C. constant speed motor for traversing the head.

The C.P.R. have successfully applied a pneumatic tool, designed by W. Peterson, of the C.P.R., Montreal, to lathes for turning car and truck wheels. In turning wheel tires it is

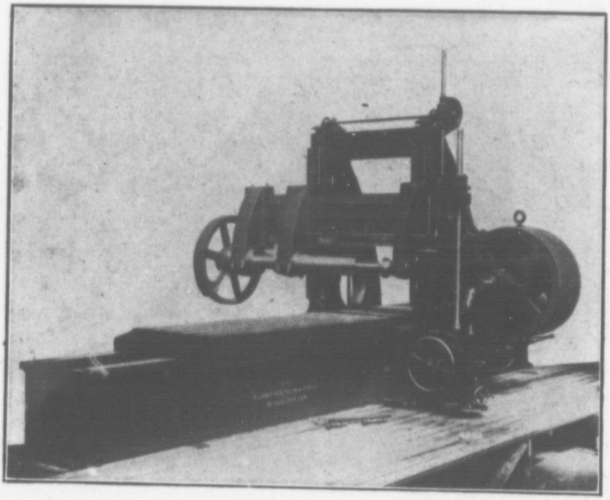

FIG. 25

necessary to change the tools three times for each tire and two men were required to the operate tools. With the tool shown, one man can operate them, the necessary champing and setting being accomplished almost simultaneously.

The toolholder shown in Fig. 27 was used on a 36 inch lathe. Forty pounds air pressure in connection with the leverages in the toolholder, holds the tool rigidly. Tool can be clamped by hand if power is not available. High speed steel tools 3 x $1\frac{1}{2}$ in. were used and a surface speed of 17 ft. per min. with a cut $\frac{1}{2}$ in. deep and $\frac{1}{2}$ in. feed per revolution with this toolholder.

A two spindle Canadian make cylinder boring machine is shown in Fig. 28. It has a bed 19 ft. 7 inches long, 48 inches wide and 10 inches deep on which is an adjustable table 57 inches long, 53 inches wide, having power traverse along the bed. When in working position it supports the outer end of boring bars, and when removed to the end of the bed the cylinder is free of the

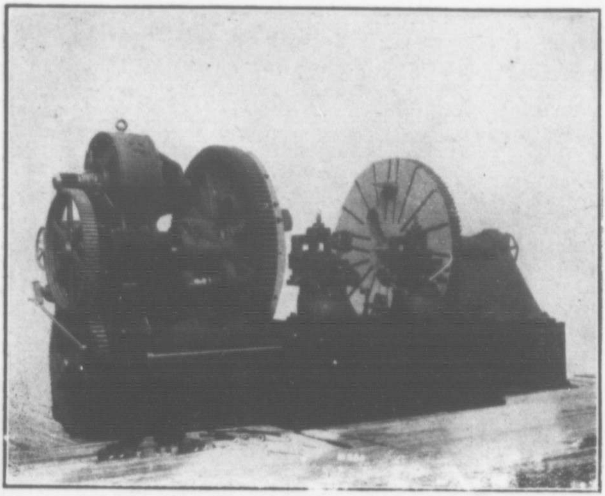

FIG. 26

bars and may be lifted without taking the bars off the machine. The large bar is 12 inches in diameter having horizontal adjustment from 15 inches to 32 inches, and is 24

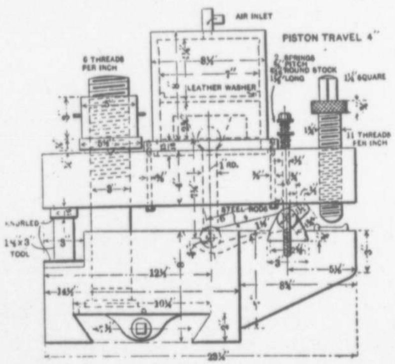

FIG. 27

inches from center of bar to top of table. The small bar is 5 inches in diameter, with horizontal adjustment of 14⅛ inches, also a vertical adjustment from 9 to 31 inches. Diameter of head on 12 inch bar, is 21 inches; diameter of head on 5 inch bar is 11¼ inches. Each bar has three changes of feed. Machine has four facing heads, two for each bar, smallest to face 20 inches in diameter and the largest 44 inches in diameter. It is motor driven by 15 h.p. D.C. 2 to 1 variable speed motor.

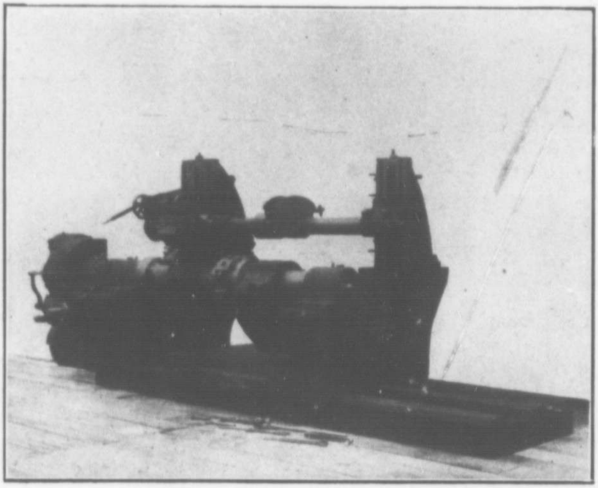

FIG. 28

Fig. 29 is a 100 inch locomotive driving wheel quartering machine. It has a capacity for wheels up to 90 inches in diameter on the tread, with from 10 to 20 inch stroke. The heads have long bearing on a substantial bed and are adjustable for axles of different lengths. These machines are built for either right or both right and left hand load. Spindles are of large diameter and have 15 inch traverse. The saddles carrying same are graduated for easy adjustment to the desired stroke. Spindles have three changes of power feed and rapid hand movement. Axles are held on centers and on adjustable "V" bearings supporting by frames to which the wheels are securely clamped. The boring spindles are provided with outboard support and also with device for truing up crank pins. Each head is arranged with motor drive by a 5 h.p. constant speed motor.

The United States make horizontal milling machine shown in Fig. 30 was built for the G.T.R. shops, Point St. Charles, and is adapted to the milling of locomotives' rods. The spindle of the machine revolves in a brass bush capped bearing in the saddle, and is driven by a sleeve worm wheel, motion being transmitted by means of a double keyway, the driving worm wheel has a bronze ring with coarse teeth of steep lead, and the driving worm is of hardened steel and fitted with roller thrust bearings, both of which are encased and run in oil.

The motor can be placed on the side of the upright, or on the foundation as desired; motion is transmitted from the

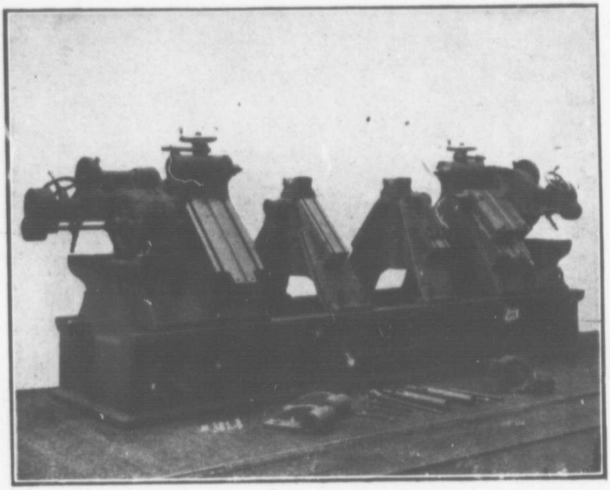

FIG. 29

motor through coarse pitch steel spur gears on the heavier machines, and bevel gears to the vertical driving shaft. The bevel gear on the horizontal driving shaft is placed below that on the vertical shaft, so that the weight of the shaft is counteracted by the pressure of the drive on the gears, and prevents a heavy thrust on the bottom bearing.

The cross rail of this machine is of the angular type, and the bearing for the sleeve of the worm wheel and for the thrust faces of the driving worm, are cast solid to prevent any vibration. As shown, the spindle saddle has cross hand adjustment on the rail for convenience in setting cutters, as also the outboard bearing, the method being to place the milling cutters on the arbor and turn the bushings to the same diameter as the bearing in the outer support, to permit adjusting this support close to the cutter, and relieve the cutter arbor of strain. The cross rail is counterweighted, and the elevating screws have a top and bottom bearing to permit of always being maintained in tension.

The cutter arbors are driven by a broad faced key, and held in the spindles by means of a through retaining bolt.

The work table is of heavy box type construction with quare locked gibbed bearings on the base, and the drive is by means of steel angular rack and bronze spiral gears, as shown

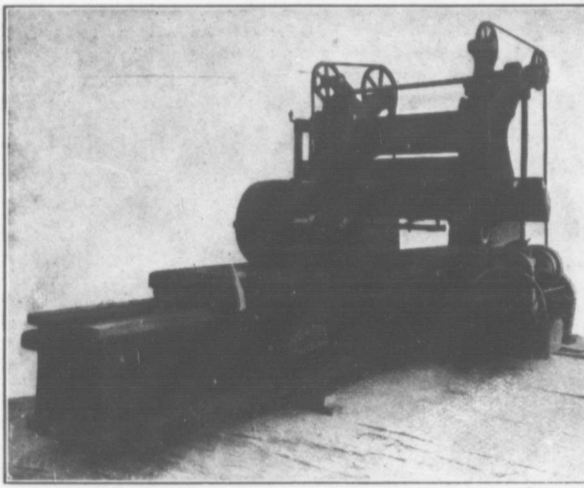

FIG. 30

in Fig. 30. All operating levers are concentrated on the working side of the machine and the one transmission serves for the operation of the rail vertically and of the table, for both reversing fast power traverse and feeds. There are nine changes of gear feed ranging from ½ inch to 8 inches per minute.

Installations of these millers at the Pittsburg works of the American Locomotive Co. show that they are slabbing rods on cuts from 14 to 18 inches wide, ⅜ to ½-inch deep, at a table feed advance of 8 inches per minute, and channeling two rods at one time, each channel being 3½ inches wide and 1¾ inches deep in one operation, at the rate of 2¼ inches to 2½ inches per minute. These results have been accomplished by means of the Tabor helical spiral inserted tooth high speed milling cutter, as shown by Fig. 31. The average removal of metal is equivalent to one cubic inch per minute of horse power.

Fig. 32 illustrates a new design of rod boring machine, with the additional adjustable support for the end of the spindles;

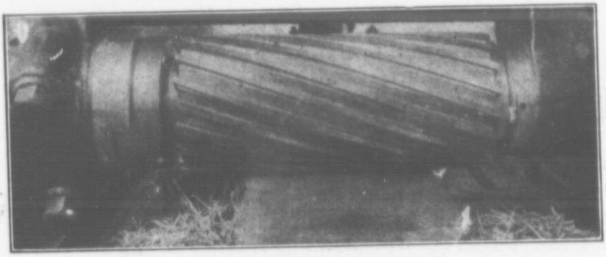

FIG. 31

when supported in this manner a cup cutter is used to trepan the rods. This view was taken in the Juniata shops of the Pennsylvania Railroad, and results show that 10½ inch diameter bores are made in rods 5-inches thick, in twenty (20) minutes, for which only a reaming cutter is necessary to finish. This method eliminates the necessity of drilling a pilot hole. Both holes are finished at the same time.

In a recent address on shop efficiency given by E. P. Bullard, president of the Bullard Machine Tool Co., he summed

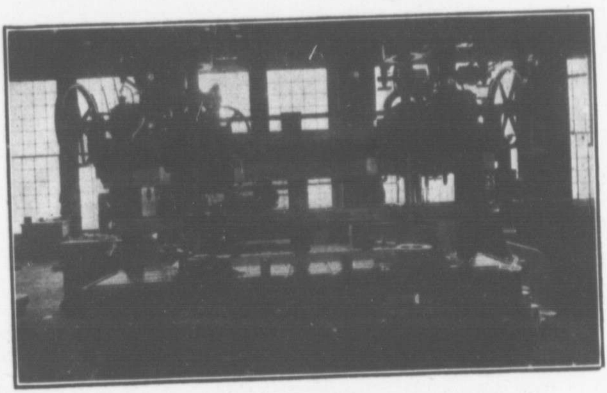

FIG. 32

up the problem of reducing shop costs in the following terse sentence, "To cut shop costs, cut the time between cuts."

As an example of the inefficiency resulting from not cutting time between cuts, he pointed out that in a prominent shop, after a difficult piece of work had been finished on a boring mill, it was necessary to wait from 10 a.m. to 3 p.m. before a new forging was available, the machine in the meantime lying idle. He also pointed out that a great deal of time is wasted in boring mill operations in adjusting the machine to the exact size required by the work and stated that a considerable time can be saved on machines equipped with micrometer dials which permit instant and accurate adjustment. He also pointed out the grave importance of the problem of lubrication to machine tool builders, stating that from 80 to 90 per cent of the repairs required on machine tools are made necessary through lack of proper lubrication. He suggested that this was a subject on which machine tool builders may profitably devote much further study, and also pointed out the necessity for providing heavier and more powerful machines to efficiently utilize modern high-speed steels.

W. R. Towne, president of the Yale & Towne Co., states that by the use of scientific methods and automatic machinery, his company within the past six years, had achieved increased output, decreased labor cost, and increased wages to employes.

In speaking with a superintendent of a large Hamilton plant recently he stated "Deliver tools to the men. Keep men busy. More time is lost in men looking for work than in actual production." In the G.T.R. shops, Stratford, this has been recognized, and in order that men may be kept busy, chasers have been appointed to keep the men supplied with the work. At first the men looked on the innovation with disfavor, but now they keep the chaser busy with requests for more work.

With the development in machine tools and improved methods between operations, greater shop production is made possible. The foregoing by no means exhausts modern practice, but it points out a number of main features and describes a number of interesting tools now found in the machine shop. Various attachments and special machines have also been devised. Perfection is a hard thing to obtain, but manufacturers of machine tools, master mechanics, shop foremen and managers are on the right track, and with the progress that is being made it may not be very long before still greater outputs will be possible.

Chairman,—

We have all listened with a great deal of interest to this paper by Mr. Keith, and as we have got a lot of business to get through to-night, I do not purpose to ask anybody in particular to make any remark on the subject. If there is anyone present who would like to ask Mr. Keith any questions in connection with this paper, I feel sure he will oblige him.

Mr. Jefferis,—

I think Mr. Keith has covered this subject in a very able manner. Any man who remembers the days when it took three months, and sometimes longer, to overhaul an engine 16 x 24 diameter and then takes into consideration the rapidity with which this work is done at the present time he will see what enormous strides have been made, or if he goes into one of the cities in the United States and sees the thousands of clever men devoting their lives as specialists to one particular tool or another—why there is nothing left to be said. These men are geniuses at their business, and they have tools down to such a condition that if our grandfathers could come back and compare them to the tools in the old shops it would surprise them probably more than the electric light would.

I am sure we have all listened with a great deal of interest to Mr. Keith's paper, and we shall be all glad to get the Journal and read it through carefully, because it will take a great deal of time to absorb all the information he has given us, especially men who have been working in general machine shops where general work only has been done and who possibly have not had an opportunity of seeing some of the immense strides that have been made during the last ten or fifteen years, they would appreciate and enjoy this paper very much.

Chairman,—

I am of the same opinion as Mr. Jefferis. I remember, not so many years ago, fifteen or eighteen perhaps, when we used to think we had done a pretty good day's work when we turned out five pairs of tires a day, now Mr. Keith tells us, they can do thirty-three in a day. I am afraid I feel something like our grandfathers would if they came back. I should like to see some of these things done before I could believe it.

If there is no further discussion, I think it would be in order for someone to move a vote of thanks to Mr. Keith.

Moved by Mr. Slade, seconded by Mr. Carmichael, that a hearty vote of thanks be tendered to Mr. Keith. Carried.

Mr. Keith,—

It is always a pleasure to do anything for this Club. I have merely tried to illustrate the modern practice in machine shops both in Canada and the United States, and I hope, at some future meeting, we will hear from someone even more familiar with the subject than I am, along these lines.

Chairman,—

We will pass on to order of business No. 12, which is the Election.

You have all got a list of the members who have been nominated by the Nominating Committee, and before proceeding I will read you section 9 of the constitution of the Club: "The officers shall be elected by ballot at the Annual Meeting in December of each year or until their successors are chosen."

You will notice on the voting papers the names of the different officers to fill the offices of the Club. These gentlemen have been nominated by the Nominating Committee, if anyone has any other names to suggest, now is the time

Mr. Wickson,—

I think we cannot do better than accept the recommendations of the Nominating Committee, and I move that the nominations as presented be accepted.

Mr. Hardisty,—

I second that proposition.

Chairman,—

It has been regularly moved by Mr. Wickson, and seconded by Mr. Hardisty, that the names of officers presented by the Nominating Committee be accepted. What is your pleasure? Carried unanimously.

Chairman,—

I declare the motion carried.

OFFICERS ELECTED FOR 1911.

President,

G. Baldwin, General Yardmaster, Canada Foundry Co., Toronto.

1st Vice-President.

J. Bannon, Chief Engineer, City Hall, Toronto.

2nd Vice-President.

A. Taylor, Foreman, Boilershop, Polson's Iron Works Limited, Toronto.

Executive Committee.

A. E. Till, Foreman, C. P. Ry., W. Toronto.

E. Logan, Machinist, G. T. Ry, Toronto.

C. G. Herring, Chief Draughtsman, Consumers' Gas Co., Toronto.

E. A. Wilkinson, Representative, Lunkenheimer Co., Toronto.

A. M. Wickens, Chief Engineer, Canadian Casualty & Boiler Insurance Co., Toronto.

W. E. Cane, Superintendent, Chapman Double Ball Bearing Co., Toronto.

A. J. Lewkowicz, Consulting Engineer, Universal Gas Co., Toronto.

Auditors.

J. Herriot, General Storekeeper, Canada Foundry Co., Limited, Toronto.

D. Campbell, Storekeeper, Consumers' Gas Co., Toronto.

A. W. Durnan, Representative, Rice Lewis & Sons Limited, Toronto.

Reception Committee.

T. Walsh.	A. W. Carmichael.	J. H. Morrison.
H. G. Fletcher.	A. W. Durnan.	W. Newman.
J. F. Campbell.	H. Ellis.	R. Pearson.
J. Herriot.	H. E. Rowell.	G. D. Bly.
C. D. Scott.	H. Cowan.	H. H. Wilson.

Mr. Jefferis,—

May I say a word for the benefit of the rank and file members of the Club. The members of the Executive and Nominating Committees have given this matter a great deal of thought and attention, and they have come to the conclusion that it is not in the best interests of the Club for the same men to be on the Executive Committee year after year, and what we would like to see would be, members from the rank and file of the Club taking a share in the management of the Club.

Secretary,—

I would like to say with regard to what Mr. Jefferis has just said that this matter was brought up at the last meeting of the Executive, and it was decided that if Past-Presidents were always elected to the Executive Committee it would only be a matter of time when the Executive would only consist of Past-Presidents, and that the Past-Presidents had better drop out and allow some of the rank and file of the Club, as Mr. Jefferis put it, to have their say at the Executive meetings of the Club, and I heartily endorse what Mr. Jefferis has said. It is better to have new blood coming in all the time.

Mr. Jefferis was the father of this idea as he considered it would be better from a business standpoint for the Club to have new members elected to the Executive Committee each year. We have tried, as far as possible, to have a representative on the Executive from each of the largest concerns connected with the Club, and I think Mr. Jefferis ought to receive a vote of thanks for bringing in that motion.

Mr. Fletcher,—

At the meeting held by the Nominating Committee it was decided that the Past-Presidents were to be mentioned amongst the list of officers, and they should be recognized as having a standing on the Executive Committee.

Secretary,—

That is just what I was going to say.

Chairman,—

As one of the officers elected, I feel that I should make a few remarks. You have seen fit to advance me to the honored position of President of the most cosmopolitan, intellectual and social institution of its kind in Canada. When I look back ten years to our old Railroad Club with its thirty members, and compare it with this splendid organization, where we have upwards of 600 members, I feel proud that I was one of its charter members and its humble Secretary, but I feel more proud to think that you have seen fit to elect me to preside over you for the ensuing year. Of course I feel that in honoring me, you honor the Company which I represent—namely, the Canada Foundry Company, Limited, from which we draw upwards of fifty members. I feel safe in predicting that with the very efficient staff of officers you have elected to assist me we should have a banner year, especially if the members will take the same lively interest as heretofore.

We have a Club that we are all proud of and from which we derive useful knowledge and instruction. Let us recollect that the ways of wisdom and knowledge are beautiful and lead to pleasure. Unison and harmony should constitute the essence of every one of our members, and while we range ourselves under that banner the Club must flourish, and animosities give place to peace and good fellowship. United in one design let it be our aim to be happy ourselves and contribute to the happiness of others.

Let us mark our superiority and distinction among men by the sincerity of our cultivating good fellowship and to improve in all what is good and amiable.

I suppose it would become me as President of this organization to assert that, in choosing me, you have made a very poor selection, but as this would be a reflection on your good judgment, there is no occasion for me to parade the fact before you, however, I have one consolation in taking the chair, and that is, that the President is not expected to make speeches, it is his business to listen. It is not his mission to inaugurate new measures, it is his duty to serve the will of the meetings. This being so, nothing remains for me but to thank you, which I do in all sincerity, for the trust and confidence you have reposed in me, and be assured that I shall earnestly endeavour to do my duty as I understand it, and gentlemen, I wish you one and all a Merry Christmas and a Happy New Year.

As Mr. Bannon does not happen to be here to-night, I would like to hear from our second Vice-President, Mr. Taylor.

Mr. Taylor,—

I do not know whether the Nominating Committee has made a mistake in electing me second Vice-President, however, we can all try to do our best, and by trying we are bound to accomplish something.

In reference to Mr. Jefferis' remarks in reference to Past-Presidents dropping out, I do not think that would be altogether advisable, as with the experience they have had they would be of invaluable assistance to the new Executive, and would help us out in case we happened to fall down, however, I thank you very much for nominating me as second Vice-President, and I will do all in my power to assist the President in his work.

Chairman,—

I will ask Mr. Till to say a few words on behalf of the Executive Committee.

Mr. Till,—

I wish to thank you all for seeing fit to elect me a member of the Executive Committee once more, and I will do my duty, as far as possible. Thank you, gentlemen.

Chairman,—

The next order of business is No. 13, Announcements.

I have just had a card handed to me by the Secretary, advising me that the paper for next meeting will be in connection with the De Beers Diamond Mines of South Africa. This will be a very interesting paper and will be given by Mr. Gaul, who is a civil engineer in the firm of Gaul & Girouard of this city, who, I understand, was an engineer in these mines, and I would very much like to see as large a gathering of members as possible.

The next order of business is general business.

Mr. Herriot,—

Under this head I would like to bring before the members the question of a donation being made by this Club to charity. At this time of the year it is the usual custom of organizations of this kind to give some financial assistance to charities. As I have never heard of this Club doing anything of this kind, I think it behooves us, as a Club, to do something, and I would propose that the Club make a grant to be divided amongst the different charitable institutions of this city.

Mr. Fletcher —

I would like to second this motion, and I think now is the time to put this over.

Mr. Jefferis,—

There is great joy in living, and the next greatest joy is in giving. We have an organization here, as Mr. Baldwin says, second to none in a great many respects. While the past year has not been a very hard one, there is always somebody in need, and as Mr. Herriot said, we can take whatever the Club sees fit to grant and divide it amongst the different charities, and I think this is the time, the place and the season to do it, let us do it and do it now.

Chairman,—

I would like to offer a suggestion. I was at a meeting similar to this last night, and the same subject was brought up, and one of the members proposed that the sum of $25 be handed to the Executive for distribution, and I think that would be a very good suggestion to work on.

Moved by Mr. Herriot, seconded by Mr. Fletcher, that the sum of $25 be handed to the Executive of this Club for them to use at their discretion. Carried unanimously.

Secretary,—

I would just like to say that the financial condition of the Club is good.

Chairman,—

There is one thing I would like to say, and that is that I have made up my mind to bring in ten new members next year; I do not know whether I will be able to do it, but I would like every other member of the Club to make up his mind that he will bring in at least one new member and if this is done you can imagine what a Club we would have.

Mr. Jefferis,—

Seeing that our Secretary has given us such valuable information as to the financial standing of the Club, do not let us forget the Old People's Home. While we shall remember the Sick Children's Hospital, there are a great many old people who live on charity from year to year, and I would just like to say that the Executive might be given the power, if they think fit, to give $40 or even $50. I think it will be all right with the Club.

Chairman,—

I think you can leave that to the Executive, Mr. Jefferis.

The members of the Executive are requested to remain for a few minutes after this meeting.

Proposed by Mr. Till, and seconded by Mr. Fletcher, that the meeting be adjourned.

At the Executive meeting it was decided that the sum of $50 be divided among the following Institutions, and that $5 be sent to each.

Toronto Hospital for Sick Children, Toronto.
Girls' Home, Toronto.
The Sacred Heart Orphanage, Sunnyside, Toronto.
Hospital for Consumptives, near Weston.
Toronto Hospital for Incurables, Toronto.
Children's Aid Society, Toronto.
Children's Home, Toronto.
House of Providence, Toronto.
Boy's Home, Toronto.
House of Industry, Toronto.

LIST OF MEMBERS.

A. W. Adams, Sales Manager, The Allen & Morrison Brake Shoe Manufacturing Co., Chicago, Ill.

J. R. Armer, Machinist, G.T.R., Toronto.

W. E. Archer, Chief Engineer, Nasmith Co., Limited, Toronto.

J. C. Armer, Editor, *Canadian Manufacturer*, Toronto.

A. Attle, Machinist, G.T.R., Toronto.

W. H. Alderson, Gutta Percha Rubber Co., Toronto.

E. C. Adams, Manager, Anchor Packing Co., Detroit, Mich.

H. C. Austen, Representative Dunlop Tire Rubber Goods Co., Limited, Toronto.

E. W. Adler, Superintendent Structural & Bridge Dept., Canada Foundry Co., Toronto.

S. H. Allen, Standard Bank, Toronto.

F. Atwater, Treasurer, Columbia Nut & Bolt Co., Bridgeport, Conn.

G. T. Allen, Manager, Hoyt Metal Co., Toronto.

H. V. Armitage, Foreman, Chapman Double Ball Bearing Co., Toronto.

J. F. Alexander, Local Manager Babcock & Wilcox, Limited, Toronto.

John Adam, Clerk, Stores Dept., Polsons Iron Works, Limited, Toronto.

J. A. W. Archer, Manager, Archer & Gerow, Toronto.

E. B. Allen, Sales Engineer, Allis-Chalmers-Bullock Co., Toronto.

W. G. Adams, Representative Frank Williams & Co., Davisville P.O., Ont.

F. Adams, Engineer, G.T.R., Stratford, Ont.

W. E. Adams, Shipper, Structural Dept., Canada Foundry Co., Toronto.

A. A. Allen, Manager, Holden Co., Montreal, Que.

J. G. Abraham, Representative Mildreim Forced Draught Furnace Co., Toronto.

J. S. Adam, Fitter, Pipe Foundry, Canada Foundry Co., Toronto.

W. H. Bowie, Mechanical Expert, New York.

G. Baldwin, General Yard Master, Canada Foundry Co., Toronto.

Acton Burrows, Editor, *Railway & Marine World*, Toronto.

A. H. Bertram, Secretary, Bertram Manufacturing Co., Toronto.

F. G. Butterfield, Butterfield & Co., Rock Island, Que.

G. Black, Road Foreman, G.T.R., Stratford, Ont.

F. W. Brent, Machinist, G.T.R., Toronto.

G. Bernard, Mechanical Inspector, Canadian Inspection Co., Toronto.

A. M. Burwell, Engineer, G.T.R., Mimico.

J. Beck, Superintendent, Union Station, Toronto.

H. H. Beasley, Storekeeper, Toronto Railway Co., Toronto.

G. D. Bly, Manager, Monarch Supply Co., Toronto.

J. Bannon, Chief Engineer, City Hall, Toronto.

J. Barker, Ex-Machinist, G.T.R., Toronto.

A. B. Brown, Canadian Representative Canadian Westinghouse Co., Montreal, Que.

C. Bugg, General Foreman, Bridge & Building Dept., G.T.R., Stratford, Ont.

C. G. Bowker, Assistant Superintendent, G.T.R., London, Ont.

W. J. Bird, National Iron Works, Toronto.

T. T. Black, Civil Engineer, Canada Foundry Co., Toronto.

G. Battley, Engineer, G.T.R., Stratford, Ont.

F. Brodie, Assistant Foreman, Canada Foundry Co., Toronto.

H. H. Brewer, General Superintendent, G.T.P. Ry., Winnipeg, Man.

E. Blackstone, Machinist, G.T.R., Toronto.

J. C. Brady, Mechanical Engineer, Goldeneast, Kootenay, B.C.

C. L. Bailey, Canadian Manager, William Jessop & Sons, Limited, Toronto.

F. W. Burrows, Representative Imperial Accident Guarantee Co., Toronto.

E. R. Battley, Locomotive Foreman, G.T.R., Fort Erie, Ont.

R. H. Brown, Brass Finisher, C.P.R., Toronto,

C. A. Burt, Fitter, C.P.R., West Toronto.

P. Brundrett, Assistant Foreman, Pipe Foundry, Canada Foundry Co., Toronto.

C. H. Bull, Machinist, Canadian Pacific Railway, West Toronto.

G. H. Boyd, Foundry Cost Clerk, Canada Foundry Co., Toronto.

E. V. Burwell, Toronto.

F. W. Barron, Chief Engineer, Copeland Brewing Co., Toronto.

C. T. Barnes, Operator, T. Ry. Co., Toronto.

M. Barker, Machinist, G.T.R., Sarnia, Ont.

J. J. Birchard, Salesman, Cluff Bros., Toronto.

G. S. Browne, Fitter, C.P.R., West Toronto.

E. A. Baines, Machinist, G.T.R., Stratford, Ont.

G. Blyth, Engineer, Chapman Double Ball Bearing Co., Toronto.

S. Best, Machinist, G.T.R., Toronto.

A. T. Bliss, Machinist, G.T.R., Toronto.

P. Brazier, Boilermaker, G.T.R., Stratford.

G. L. Bigley, R. Bigley Manufacturing Co., Toronto.

R. Burns, Superintendent, Philip Carey Manufacturing Co., Toronto.

F. Bastow, Gentleman, Toronto.

D. Campbell, Storeman, Consumers' Gas Co., Toronto.

K. D. Clarke, Representative Harbison Walker Refractories, Limited, Buffalo, N.Y.

G. Cooper, Road Foreman, G.T.R., Hamilton, Ont.

W. Carter, Salesman, Winnipeg, Man.

H. Cowan, Foreman, Motor Shops, Toronto, Railway Co., Toronto.

J. M. Clement, Foreman Fitter, Boiler Dept., Canada Foundry Co., Toronto.

O. A. Cole, Manager, Crown Gypsum Co., Toronto.

S. Crossley, Dining Car Conductor, G.T.R., Toronto.

W. B. Cookson, Representative, Imperial Varnish & Color Co., Toronto.

W. H. Chidley, Locomotive Inspector, G.T.R., Stratford, Ont.

J. F. Campbell, Representative, Elaterite Paint Co., Toronto.

W. H. Clark, Salesman, Toronto.

W. S. Cowan, Foreman Driller, Canada Foundry Co., Toronto.

H. Cross, Blacksmith, Consumers' Gas Co., Toronto.

W. Crane, Manager of Works, Pease Heating Co., Toronto.

W. E. Cane, Superintendent, Chapman Double Ball Bearing Co., Toronto.

B. W. Coghlin, Manufacturer of Railway Spring & Truck Tools, Montreal, Que.

A. W. Carmichael, Representative Canadian Supply Co., Toronto.

G. Cook, Engineer, Consumers' Gas Co., Toronto.

F. Clement, Conductor, G.T.R., Sarnia, Ont

H. J. Carruthers, Engineer, G.T.R., Sarnia, Ont.

W. J. Commins, Manager, Roofing Dept., H. W. Johns-Manville Co., Toronto.

W. A. Chapman, Manager, Rail Joint Co. of Canada, Montreal, Que.

J. Cave, Chief Electrician, Canada Foundry Co., Toronto.

B. Clark, National Iron Works, Toronto.

R. M. Carmichael, Toronto.

J. Craig, General Superintendent, Canada Foundry Co., Limited, Toronto.

F. A. Corns, Principal, Dominion Engineering Academy, Toronto.

A. T. Cowpersmith, Engineer, Consumers' Gas Co., Toronto.

C. Chappelle, Apprentice, G.T.R., Toronto.

G. F. Clark, Machinist, Consumers' Gas Co., Toronto.

A. Chenoweth, Machinist, G.T.R., Stratford, Ont.

W. A. Conroy, Fitter, C.P.R., West Toronto.

D. Cairns, Draughtsman, Consumers' Gas Co., Toronto.

S. Cowan, Machinist, Chapman Double Ball Bearing Co., Toronto.

G. G. Conlin, Engineer, S.S. "Kingston," R. & O. Navigation Co , Toronto.
T. B. Cole, Engineer, Christie Brown Co., Toronto.
W. H. Church, Foreman, Pipe Shop, Canada Foundry Co., Limited, Toronto.
J. R. Donnelly, Master Mechanic, G.T.R., Allandale, Ont.
A. W. Durnan, Rice Lewis & Son, Toronto.
E. F. Dartnell, Merchant, Montreal.
J. Duguid, Master Mechanic, G.T.R., Montreal.
D. A. Dickson, Chief Engineer, Temple Building, Toronto.
J. Dodds, Government Steamboat Inspector, Toronto.
W. Dyer, Engineer, G.T.R., Stratford, Ont.
J. M. Downer, Downer Pattern Works, Toronto.
W. E. David, Machinist, Consumers' Gas Co., Toronto.
J. Dewsbury, Machinist, G.T.R., Toronto.
F. R. Davis, Chief Engineer, Joseph Simpson & Sons, Toronto.
C. L. Drury, Representative Drury Iron & Steel Co., Toronto.
F. D. Dewar, Representative H. W. Johns-Manville Co., Toronto.
J. Dickson, Foreman, Blacksmith Shop, G.T.R., Toronto.
W. J. Dempster, Electrician, Toronto.
C. Daniel, Foreman, Moulding Shop, Canada Foundry Co., Toronto.
J. C. Donald, Foreman Carpenter, Canada Foundry Co., Toronto.
F. H. Dence, Traveller, Canadian Fairbanks Co., Toronto.
W. Dony, Machinist, G.T.R., Toronto.
G. H. Dyer, Proprietor, Brighton Laundry Co., Toronto.
S. G. Dabner, Machinist, Canada Foundry Co., Toronto.
J. S. N. Dougall, President, The Dougall Varnish Co., Limited, Montreal.
L. Davidson, Machinist, G.T.R., Toronto.
A. S. Doran, Machinist, Polsons Iron Works Limited, Toronto.
G. Despond, Manager, Standard Foundry, Toronto.
G. Dickson, Rogers Electric Co., Toronto.
D. Dingwall, Representative Philip Carey Manufacturing Co., Toronto.
J. B. Dunlop, Machinist Improver, G.T.R., Stratford, Ont.
H. O. Eddrup, Clerk, G.T.R., Toronto.
H. Ellis, Foreman, Machine Shop, Consumers' Gas Co., Toronto.
G. E. Evans, Resident Engineer, Dominion Bridge Co., Toronto.
W. Evans, Government Steamboat Inspector, Toronto.
H. Eatherley, Machinist, Bawden Machine Tool Co., Toronto.
R. C. Fisher, Manager, Rice Lewis & Son, Limited, Toronto.

J. J. Fletcher, Manager, Casey Hedges Co., Chatanooga, Tenn.

F. S. Ferguson, Local Superintendent, Canada Iron Corporation, Limited, St. Thomas.

J. J. Fisher, Engineer, G.T.R., Sarnia, Ont.

H. G. Fletcher, Representative Garlock Packing Co., Toronto.

R. H. Frees, Manager, Malleable Iron Co., Walkerville, Ont.

W. H. Farrell, Terminal Superintendent, G.T.R., Toronto.

R. H. Fish, Road Foreman, G.T.R., London, Ont.

J. T. Fellows, Draughtsman, Consumers' Gas Co., Toronto.

E. J. Friend, Engineer, Canada Foundry Co., Toronto.

A. Fraser, Foreman Drillhand, Chapman Double Ball Bearing Co., Toronto.

J. Fraser, Machinist, G.T.R., Stratford, Ont.

E. G. E. Ffolkes, Wilkinson Plough Co., Toronto.

M. Foy, Chief Engineer, Toronto Cold Storage Co., Toronto.

I. O. Frost, Carpenter, G.T.P.R., Elm Park P.O., Alberta.

R. Graham, Mechanical Engineer, Toronto.

J. S. Gray, Foreman Machinist, Polsons Iron Works Limited, Toronto.

W. J. George, Engineer, G.T.R., New Toronto.

J. C. Garden, Master Mechanic, G.T.R., Battle Creek, Mich.

R. W. Grace, General Superintendent, Flat Iron Works, Dayton, Ohio.

E. Garrigan, Foreman, Structural Department, Canada Foundry Co., Toronto.

W. H. Ginder, President Ontario Lantern & Lamp Co., Hamilton, Ont.

U. E. Gillen, Superintendent, G.T.R., Toronto.

J. W. Griffin, Motor Shops, Toronto Railway Co., Toronto.

J. C. Grant, Representative B. F. Sturtevant Co., Toronto.

M. R. Griffiths, Manager, H. W. Johns-Manville Co., Toronto.

J. C. Gartshore, Railway Equipment, Toronto.

A. W. Givin, Representative Standard Filling & Valve Co., Guelph, Ont.

C. H. De Gruchy, Representative Finley-Smith Co., Toronto.

C. Geldart, Foreman, Machine Shop, G.T.R., Stratford, Ont.

W. T. Giles, Palmer Piano Co., Toronto.

E. B. Gilmour, Superintendent, Moulding Dept., Canada Foundry Co., Toronto.

G. S. Grassick, Salesman, Consumers' Gas Co., Toronto.

W. R. Gardner, Engineer, C. & W. Walker Co. (England), Toronto.

J. Greville, Apprentice, G.T.R., Toronto.

T. E. Greenshields, Machinist, G.T.R., Toronto.

E. S. T. Gerow, Manager, Archer & Gerow, Toronto.

A. A. Gardner, C. & W. Walker Co. (England), Toronto.

R. A. Girouard, Civil Engineer, Gaul & Girouard, Toronto.
W. A. Grocock, Engineer's Representative, Toronto.
T. Graham, Assistant Engineer, City Hall, Toronto.
G. A. Greene, Toronto.
S. Hall, General Foreman, Polsons Iron Works Limited, Toronto.
Jos. Haines, D. K. McLaren Co., Toronto.
J. E. Houghton, Chief Operator, G.T.R., Toronto.
J. W. Harkon, Consulting Engineer, Melbourne, Que.
G. W. Hardy, Engineer, G.T.R., Sarnia Tunnel.
Hannibal, Green's Sons & Co., Troy, New York.
J. Herriot, General Storekeeper, Canada Foundry Co., Toronto.
J. G. Hyde, Machinist, G.T.R., Toronto.
A. D. Homard, Travelling Engineer, Detroit Lubricator Co., Detroit, Mich.
Thomas Hampton, Representative Edgar Allen Co., Limited, Montreal, Que.
D. C. Hallowell, Machinist, G.T.R., Toronto.
T. A. Hollinrake, Manager A. R. Williams Machinery Co., Toronto.
J. Hay, Locomotive Foreman, G.T.R., London, Ont.
W. A. Hare, Standard Engineering Co., Toronto.
L. Haives, Salesman, Toronto.
W. Hamilton, Foreman, G.T.R., Stratford, Ont.
A. E. Hawker, Mechanical Engineering, Toronto.
H. Hitchen, Foreman, Central Vermont Railway, St. Albans, Vt.
T. E. Hicks, Assistant Foreman, Bridge Dept., Canada Foundry Co., Toronto.
A. Hallimore, Machinist, G.T.R., Toronto.
W. D. Hall, Superintendent of Tunnel, G.T.R., Port Huron, Mich.
C. G. Herring, Chief Draughtsman, Consumers' Gas Co., Toronto.
H. O. R. Horwood, Leveller, Dominion Bridge Co., Toronto.
P. J. Harley, Machinist, G.T.R., Stratford, Ont.
M. C. J. Hockin, Representative Chapman Roller Bearing Co., Toronto.
T. Henry, Chief Engineer, Erindale Power Co., Toronto.
W. Higgins, Inspector, Insurance Dept., T. Eaton Co., Toronto.
L. S. Hyde, Clerk, G.T.R., Toronto.
M. A. Humber, Apprentice Instructor, G.T.R., Stratford, Ont.
J. H. Hartley, Clerk, G.T.R., Toronto.
F. Hardisty, Engineer, G.T.R., Sarnia, Ont.
J. L. Hutcheson, Superintendent Booth Copper Co., Toronto.

C. M. Henderson, Superintendent, Holden & Schofield Machine & Tool Co., Toronto.

R. C. Hamilton, Clerk, Canadian Freight Association, Toronto.

M. B. Horan, Superintendent, Pipe Foundry, Canada Foundry Co., Toronto.

T. Honey, Fitter, Canada Foundry Co., Toronto.

J. Hughson, Representative British-American Oil Co., Toronto.

W. J. Hayes, Engineer, G.T.R., Stratford, Ont.

J. J. Harris, Chief Engineer, O'Keefe Brewery Co., Toronto.

F. G. Herbert, Chemist, Canada Foundry Co., Toronto.

J. Irwin, Engineer, G.T.R., London, Ont.

W. H. Jackson, Representative McColl Brothers, Toronto.

C. A. Jefferis, General Superintendent, Consumers' Gas Co., Toronto.

J. V. Jackson, Boiler Inspector, G.T.R., Montreal, Que.

C. A. Jackson, Machinist, Buffalo, N.Y.

I. Jefferis, Machinist, G.T.R., Toronto.

W. J. Jones, Machinist, G.T.R., Toronto.

A. Johnston, Travelling Engineer, McColl Brothers, Toronto.

J. G. Jones, Chief Engineer, Manufacturers Life Building, Toronto.

A. E. Juhler, Sales Manager, London Machine Tool Co., Toronto.

F. H. Jarm, Chemist, Toronto.

P. Jerreat, Machinist, Adams Harness Co., Toronto.

C. Johnston, Clerk Consumers' Gas Co., Toronto.

J. Jackson, Boiler Maker, Consumers' Gas Co., Toronto.

A. Jones, Machinist, G.T.R., Stratford, Ont.

E. Kennedy, Engineer, G.T.R., Sarnia, Ont.

J. A. Kilpatrick, Manager, Canada Iron Corporation, Limited, Montreal, Que.

G. C. Keith, Managing Editor, *Canadian Machinery*, Maclean Publishing Co., Toronto.

G. Kyle, Steam Fitter, Consumers' Gas Co., Toronto.

A. H. Kirby, Chief Engineer, Methodist Book Room, Toronto.

R. Kellog, Manager, Kellog & Co., Toronto.

W. J. Keating, Brass Manufacturer, Toronto.

J. Kennedy, Boiler Maker, G.T.R., Stratford, Ont.

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F. W. Landymore, Telegraph Operator, G.T.R., Toronto.

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J. O. B. Latour, Insurance Inspector, Toronto.

P. J. Lynch, Superintendent, G.T.R., Allandale, Ont.

J. E. Lenehan, Representative Galena Signal Oil Co., Richmond, Que.

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E. Logan, Machinist, G.T.R., Toronto.

J. Lusk, Engineer, G.T.R., Sarnia, Ont.

J. Lyons, Engineer, G.T.R., Sarnia, Ont.

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J. McWater, Machinist, Consumers' Gas Co., Toronto.

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G. McIntosh, Air Brake Instructor, G.T.R., Stratford, Ont.

N. McNichol, Storekeeper, Humber P.O.

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T. McKenzie, Bursar, Mercer Reformatory, Toronto.
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J. W. McLintock, Clerk, G.T.R., Toronto.
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J. H. Morrison, Representative Federal Clay Products, Toronto.
G. T. Merwin, General Agent, Canada Car Co., Limited, Montreal, Que.
J. Markey, Master Mechanic, G.T.R., Toronto.
P. J. Myler, Representative Canadian Westinghouse Co., Hamilton, Ont.
J. Mooney, Road Foreman, G.T.P., Rivers, Man.
F. Moneypenny, Vice-President Imperial Varnish & Color Co., Toronto.
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G. A. Mitchell, Master of Bridges & Buildings, G.T.R., Toronto.
R. Muirhead, Passenger Yard Master, G.T.R., Toronto.
G. Matheson, Charge Hand, G.T.R., Ferries, Windsor, Ont.
D. Murray, Manager, Murray Printing Co., Limited, Toronto.
A. Maynes, Road Foreman, C.P.R., Toronto.
J. Mauldey, General Foreman, Dominion Bridge Co., Toronto.
B. J. Markle, Superintendent Dominion Bridge Co., Toronto.
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H. H. Wilson, Chief Engineer, Murray-Kay Co., Limited, Toronto.

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