course, in the modern shop the wheel and tire machinery In regard to the strength of the machine tools not being

In regard to rn estrength of the machine tools not being up to date or not being as strong or heavy as required for the present tool steel. I agree with you that we have a great many old tools in our shops which are too weak and which cannot stand the strain which could be given them when using the best grade of modern steel. I find them when using the best grade of modern steel. I had that the new tools which we have received have been strengthened considerably, but we have been unable to reach the limit of the best self-hardening steels, on account of the vibration of the machines. Our experience with electrically driven repair shops

warrants me to say that the application of the electric motor, especially where shops are remotely located from each other, institutes quite a saving, especially on account of being able to put up a modern and economical isolated power house and get less transmission losses.

FROM MR. W. RENSHAW, SUPERINTENDENT OF MACHINERY OF THE ILLINOIS CENTRAL.

OF THE ILLINOIS CENTRAL. It would be advantageous in large shops to operate large machine tools with independent motors, and to group the smaller tools into units not less than 25 h.p. It would be quite expensive to do this by remodeling an old shop, and, therefore, it is a question if it would be economical, particularly where old machines are already in use. I think the matter is well worthy of consideration,

however, in the equipment of new plants where the first cost of shafting and belting could be dispensed with.

### The Hall Electro Gas Signal.

Hall semaphore signals worked by gas motors are now in use on a number of important railroads, and the orders which have been received by the Hall Company for signals of this kind, filled and being filled, aggregate 1,100 blades. The apparatus for working the signal, which has already been briefly described in these columns, is shown i detail in Figs. 1, 2 and 3. Fig. 1 is a perspective view of the double gas mechanism for working a home and a distant signal on the same post. The lower ends of the rods which connect with the signal arms appear at the top which connect with the signal arms appear at the top of the engraving. The power is applied through the vertical cylinders. These cylinders are movable, being rigidly attached to the signal rods, while the piston is fixed to the base of the frame. The gas, entering through the piston, forces the cylinder upward, clearing the sigthe piston, forces the cylinder upward, clearing the sig-nal. Fifty pounds of liquid carbonic acid gas is stored in a tank about 4 ft. long and  $\$/_2$  in. outside diameter, which is kept in a well at the foot of the post. The well will hold two tanks. On the top of the tank is a valve with a connection leading to the reducing valve, where the pressure is reduced from 800 lbs, per sq. in. to about 40 lbs. The valve on the top of the tank has a safety valve which will blow off at a pressure of 2,400 lbs. The tanks are tested to 3,700 lbs. The stanks are tested to 3,700 lbs. This great strength is required

because of possible temperature changes, the pressure in-creasing with a rising temperature. If the tanks were creasing with a rising temperature. left in a hot sun a sufficient time the pressure might increase to the blowing off point. The admission of the gas to the working cylinders is

controlled by a valve which is opened and closed by the armature of an electro magnet. In the engraving the magnets for the distant and the home signals are seen at the left and the right respectively. In automatic block signaling these magnets are energized in the usual way by a local circuit controlled by the relay of the track circuit. When a signal has been cleared it is held in the clear position by a series of levers and latches which will be presently described. Suitable circuit closers or electric switches are provided to insure the operation of the two signals in proper sequence, the distant to be cleared after the home signal has been cleared.

The construction of the mechanism s shown in Fig. 2, consisting of front and side elevations and a sec-tion through the line A B of the front elevation. In referring to this drawing the general number (19) will be omitted, 19.00 being referred to as 00. In this drawing 01 is the frame, 00 the cylinder and piston complete, and 29 the pedestal supporting the piston, through which the supply pipes 80 and 81 pass from

the supply pipes 80 and 81 pass from the valve to the cylinder. Pipe 79 leads from the reducing valve 31 to the expansion chamber, and from there to the electrically controlled valves 100. Pipe 82 comnects the supply tank to the reducing valve. The armatures 12 operate the valves 100 by means of 109 and the other connections shown in Fig. 2. Clutch levers 14 and 15 hold the signal elear.

signal clear. Latch 21 (sectional view) en-gages with the clutch lever while holding the signal clear. No. 07 (side view) is the clutch arrature. Nos. 16 and 17 are buffer levers to prevent the clutch lever from striking the ends of the magnets when the signal goes to danger. They also hold the clutch armature a short distance from the poles of the magnets while the signal is at danger to prevent them from fraceing fast in case moleture condenses on them in from freezing fast in case moisture condenses on them in cut-off levers 114 and 115 are to cut-off the supply of

sufficient avers 114 and 115 are to curon the supply of gas from the working cylinder, and allow it to escape, when the signal has reached the clear position. These levers are controlled by pawls, 116. The clutch casting, 09, is clamped on the cylinder rod, and is guided by the guide rod 47. This casting can be placed higher or lower on the cylinder rod so as to change the stroke of the cylinder. It also carries the roller 20, which engages pawl 116 at the end of the upward stroke, and cuts off the gas, the signal having then reached the position for which it is adjusted. The magnets, 39, have front armatures to operate the

gas valve, and rear armatures to hold the signal in the clear position.

85, on top of the left hand magnet, is an electric No. switch operated by rod 44 when it is engaged by the stud 19. This switch does not appear in the perspective view, Fig. 1

The gage on the reducing valve, 31, has two pointers and shows both the pressure in the supply tank, and the working pressure

clearing the signal, the magnets 39 are energized, and the armatures 07 and 12 are attracted; and the valve is opened by means of its connections, 37, 109 and 108.



The exhaust valve 95 (Fig. 3) is forced against its seat, The exhaust valve 95 (Fig. 3) is forced against its seat, and supply valve 96 is opened, allowing gas to enter the working cylinder through the pipe 81. This forces the cylinder up, and puts the signal in the clear position. As soon as latch 21 has passed the toe of clutch lever 15, the roller 20 raises the pawl 116 and allows the cut-off lever 115 to move downward. This, being engaged with the nut 119, forces the links 121 and 108 down, opening the exhaust valve 95, and closing the supply valve 96. The entire working of the circulator work, more than the letch 91. entire weight of the signal now rests upon the latch 21, where it is engaged with the clutch lever and is held in the all-clear position on account of the magnets being energized and holding the armature 07. The electric switch 85, used to change the current in

the magnets after the signal is cleared, is operated by



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## THE RAILROAD GAZETTE

means of the stud 19 raising the rod 44 and rotating the

means of the stud 19 raising the rod 44 and rotating the shaft of the switch which makes the contacts. When the magnets are de-energized, as by the entrance of a train to the section, the armature 07 is released, and the clutch lever 15 swings backward and allows latch 21 to pass the toe of this lever. The signal then assumes

with the greater capacity of the expansion chamber, the increase is very small.

The cylinders and pistons are made of phosphor bronze and ground to fit; no packing rings are used and no lubri-cation is necessary. The area of the piston is 5 sq. in. By using 40 lbs, pressure, which makes a force of 200 lbs.



Fig. 1.-Double Gas Mechanism of Hall Semaphore Signal.

the danger or stop position by gravity. The cylinder acts as a dash pot on account of the check valve 98 partly connected between the reducing valve and the electrically controlled valves, serves the purpose of equalizing the pressure in cases where the liquefied gas finds its way to the reducing valve, and part of it freezes when expanding in the low pressure chamber. When this melts and be comes gas, it will, with the small cubic capacity of the reducing valve alone, greatly increase the pressure; but.



Fig. 5 .- Box for Motor and Batteries-Hall Gas Signal.

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Fig. 4.-Hall Semaphores on Tubular Iron Post.

there will be at least a margin of 50 lbs, over the weight of the ordinary blade grip. This margin can be increased to anything desired, by increasing the gas pressure. With this pressure and a 60 deg. movement of the arm, 200 signal movements are made per pound of gas, or 10,000 from each 50 lb, tank of gas.

from each 50 lb, tank of gas. One end of the magnets is utilized to hold the signal clear and the other to operate the valve. The amount of energy required to operate the valve is .1 watt, and to hold the signal clear is .045 watt. By means of two wind-ings on the magnets the energy is reduced, after the valve is operated and the signal is cleared. The two windings are used in multiple to operate the valve; then one bat-tery is disconnected and the signal is held clear with the other; or, in case of slow releasing clutches, the one winding is disconnected from the battery and closed upon itself to prevent the cores becoming immediately demag-netized. A current of four volts is used on these slow releasing clutch magnets, and Ol13 ampere. With this releasing clutch magnets, and .0113 ampere. With this energy the signal is held clear  $2\frac{1}{2}$  seconds after the circuit is opened.

The first electric gas signal was put up near Buffalo The first electric gas signal was put up near Buffalo Feb 4, 1902, and, though somewhant crude, gave satisfac-tory service for more than a year, when it was replaced by a later design. The road on which this first signal was used, like most other roads which have ordered gas signals, had used electric motor signals extensively, and close the gas apparatus after carefully comparing it with electric motors in the matter of simplicity, cheapness and reliability. The gas signal has been found to be free from electric motors in the matter of simplicity, cheapness and reliability. The gas signal has been found to be free from disturbance by frost, as the dry gas which is exhausted into the closed case after each operation of the signal takes up whatever moisture may be in the atmosphere, and there is no deposition of frost on the metallic parts.

At 4½ cents a pound the cost of power for this signal, estimating 200 signal movements per pound of gas, is less than 25 cents per thousand movements. Liquid carbonic acid gas can be bought in almost any large city. motor could, of course, be worked by compressed air. The

#### Car Accountants' Association.

The announcement of the annual meeting of this asso ciation will be found in another column. The reports of the committees on (a) Discussion, (b) Per diem, (c) on Large cars and Light loading, together with a paper by Mr. Charles C. Riley, of the Chicago Great Western, will be found in substance below.

SUBJECTS PROPOSED BY COMMITTEE ON DISCUSSION 1. Is it desirable to report both receipts and deliveries on junction cards, and should they not be sent by U. S. Mail?

2. How should penalty tracers received from other lines be handled, and in case cars have left prior to date of receipt of notices, should car owners be notified?

What is the best method of giving the road people 3. the information to show how long foreign cars have been on the road; can agents depend on the route card for this information?

Best method for keeping a record of home cars on foreign lines in order to report daily the cars away from home 20 days?

Is it desirable, on large roads, to keep a separate 5 junction record of home cars on foreign lines? 6. Errors and omissions on reports of cars inter-changed: What is being done to secure uniform prac-

changed: What is being done to secure uniform prac-tice: what constitutes a delivery to water lines, and is Rule No. 14 intended to cover such deliveries? 7. Best method for handling reports and rendering / reclaim statements provided for in Per Diem Rule No. 5. 8. Has it been found practicable to carry out Per Diem Rules 14 and 15? Do rules now in effect release own and place them is hown such suider, they under cars and place them in home route quicker than under the mileage basis?

## REPORT OF COMMITTEE ON PER DIEM.

During the past year the Per Diem Committee has had two meetings at Chicago, at which a large number of the memberships of this Association was present, and the Com-mittee held a number of informal meetings. There is a general feeling that the per diem rate should be increased from 20 to 30 cents: 20 cents is no incentive to secure the return of cars. Neither is it probable that 30 cents will be much of an incentive during the time of car shortage. Delay is as a rule on the borrowing line which can afford to pay 30 cents rather than to purchase cars. The car owner loses money in maintaining equipment at the present per diem rate. When the demand for cars is mall, 20 cents or even 10 cents will cause return of cars to owners.

Among the higher officers it is thought that Rule 3 should be so changed as to make its workings automatic. This feeling is not entertained by the majority of Car Service men, who favor the rule in its present form. The Committee has no recommendations to make in regard to this rule. The demand for penalty is now being made by nearly every road whose cars are being detained for by nearly every road whose cars are being detailed for more than 20 days. The only important change in the car record office, should the rule be amended so as to make it automatic, would be that the time and watchfulness now expended in writing penalty notices would have to be devoted to the securing of prompter movement of for-ation cars. eign cars.

A great evil has grown up as a result of the applica-A great evil has grown up as a result of the applica-tion of Rule 3 which would probably become more aggra-vated were this rule to work automatically, and that is the wholesale diversion to which equipment is subjected. The experience of the Committee is the experience of a large number of Car Service men from whom commu-nications have been received that nearly every road in this country during the past whiter seemed to lose all sense of justice in regard to the handling of foreign cars and loaded them regardless of initials and ownership. During the congested period of last winter it was the common practice of a large number of roads to deliver cars to connections for no other purpose than to break put is of the opinion that some additional penalty should but is of the opinion that some additional penalty should be imposed for diverting cars to connecting line for that purpose.

Your Committee recommends that where discrepancies exist as to date of receipt of cars, penalty notice covering such cars should be accepted as applying to date as shown

such cars should be accepted as applying to date as shown by records of receiving road, pending adjustment. Rule 5 as now applied is a source of revenue for switch-ing lines. An arbitrary number of days cannot be de-termined in any large switching center which will be fair for each road interested. The bad results arising from the workings of Rule 5 are possibly due as much to the application in the different centers as to the rule itself. As the line bringing a corr into a terminal is roitself. As the line bringing a car into a terminal is re-sponsible for its delivery to consignee and therefore liable for the switching service, your Committee feels that such originating line should not be taxed in the way of a re-claim for an amount greater than the actual cost in per diem to the switching line. It would, therefore, recom-mend to this Association the following substitute for Rule No. 5 :

No. 5: "The road performing switching service for another road may reclaim from such road for each car in switch-ing service an amount equal to the per diem actually paid by the switching line up to a maximum number of days to be determined by the roads directly interested in each local territory." This rule would do no injustice to either line. If it requires four days for the switching road to duings case

This rule would do no injustice to either line. If it requires four days for the switching road to deliver cer-tain classes of freight to consignee, the originating line should certainly reimburse the switching road for the per diem paid. On the other hand, if the switching road is able, as is the case in many large terminals to handle hundreds of cars of stock to and from stock yards in the same day for which it pays no ber diem, it is certainly not fair that it should be permitted to make a reclaim of 60 or 80 cents per car against the delivering line.

The railroads centering in St. Paul and Minneapolis have The Failbads centering in St. Faul and Minneapolis have taken an advance step in regard to reclaims. On February 1 the following rule was put into effect in the cities named, the workings of which have given general satis-faction: "The payment of reclaims to the Minneapolis

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